CHEMICAL & METALLURGICAL ENGINEERING

McGraw-Hill Co. Inc. March 24, 1924 25 cents per copy

CHEMICAL & METALLURGICAL ENGINEERING

McGRAW-HILL COMPANY, INC.
JAMES H. McGRAW, *President*
E. J. MEHREN, *Vice-President*

H. C. PARMELEE
Editor

Volume 30 | New York, March 24, 1924 | Number 12

The Exceptional Case Of Mr. Burbank

WITH the wit that usually acts as a vehicle for his preachments, the columnist of a New York daily calls attention to the fact that Luther Burbank is about to celebrate the seventy-fifth anniversary of his birth, and adds:

> Mr. Burbank is the exceptional American in that he achieved distinction in one line of endeavor without assuming that it gave him authority, or made him competent, to give instruction on every other subject under the shining sun.

This will arouse a host of memories in the mind of every reader. For our own part we are dimly aware of a group of subconscious impressions about federal tax revision, adjusted compensation for soldiers and the disposal of Muscle Shoals. One of the curious consequences of our system of government, particularly in the legislative branch, is that the men who are picked primarily for political reasons automatically assume a knowledge of affairs and ability to deal with problems for which they have no fitness. The result is inevitable. We need more Burbanks—particularly in government.

Dye Industry Troubles At Home and Abroad

LATELY some of the aged opponents of the domestic dye industry appear to have taken a new lease on life with every indication that an active conflict is forecast for the immediate future. Naturally some reaction on the part of the textile industry to the high duties of the 1922 tariff was to have been expected, but recent maneuvers, as well as those in the past, can be traced directly to the dyestuff importers, the agents of the foreign producers.

Strangely enough, it would seem that in England much the same situation exists. The importers—they call them merchants over there—have been quick to take advantage of the weakness of the British Dyestuff Corporation implied by the negotiations for an Anglo-German combine and are using this proposed agreement as a lever to pry loose the import provisions of the dyestuff act of 1921. In reporting a recent hearing of importers before the Board of Trade, *The Chemical Age* (London) remarks, "While the national need for the building up of a great dye-making industry in this country is fully recognized, the deputation argued that this should not be done to the detriment of those already engaged in merchanting foreign dyes and the possible detriment also of the users of dyestuffs." To provide a tariff to serve equally well all of these interests is the discouraging problem put up to the British tariff experts.

Another dye merchant, Fred T. T. Reynolds, writing in the Manchester *Guardian*, insists that "the main thing generally desired is to get rid of the Board of Trade control with the irritating and discriminating license system, with the tiresome, superfluous regulations and its petty and finnicking repetitions, delays and exactions."

This plaint of the British importer is strangely familiar. Last week's news from Washington reported that Representative Frear of Wisconsin had introduced a bill to reduce the American tariff on coal-tar products "upon representations by importing interests that the provisions of the coal-tar paragraphs of the tariff act and the administration of these provisions under Treasury regulations are working undue hardship upon their business." Furthermore they contend "that American valuation is difficult to administer, seriously interferes with the certainty of contracts and causes delay in getting products through the custom houses."

There can be no doubt that the Frear bill, although itself innocuous, is the forerunner of a legislative effort that sooner or later will have the serious attention of Congress. It is indicative both of the sort and the source of the opposition that is to be expected. It will serve a good purpose, however, if it brings the dye and coal-tar chemical industry to a realization that the battle for tariff protection did not end with the signing of the act of 1922—that an active campaign of education must be prosecuted if the industry is to continue its present development and progress.

The Psychology Of Introduction

A GOOD salesman invariably considers and capitalizes the psychology of introduction, but the technical man is likely to neglect it, particularly when it comes to seeking or accepting a position. Probably it is because the technical man has comparatively little selling instinct that he forgets or disregards this important factor in business relations. He assures himself that the salary is satisfactory, that the opportunity for advancement is good, that living conditions are possible, but he never thinks about his method of induction into a new job, and frequently this neglect is disastrous.

Let us take an example. A chemical engineer has accepted a position with the Blank Corporation in which he is to study production methods and recommend improvements. Both the engineer and the corporation are enthusiastic about the prospect. The old methods of the corporation will eventually be displaced by modern equipment and control with which the engineer is familiar. Everything seems lovely and the future looks bright.

The executive suggests the first problem at one of the large plants operated by the company and he sends the engineer down to the plant with a note to the superintendent. It is an innocuous sounding note to the effect that "Mr. Jones is coming down at my request to study such and such a process. Naturally he will be subject to the regulations of the plant, but will report directly

to me. I do not need to solicit your hearty co-operation, etc."

Yet what was the result? Immediate hostility toward the newcomer manifested itself in obscure but effective ways. Necessary jobs were not done. Important analyses were "lost" or doctored. The outward friendliness of the superintendent and his assistant was impeccable. But with the rest of the organization neutral at first and then won over by the personality of the engineer, the real attitude was gradually disclosed.

There was nothing wrong with the engineer. There was nothing wrong with the executive. There was not much the matter with the superintendent, except that he was stupid and short sighted. All were human beings and fundamentally a credit to the human race. The difficulty in the situation was the psychology of introduction. The executive did not sell the engineer to the superintendent. He did not even attempt to create a desire to have the engineer come down to the plant. And the engineer, too, forgot that psychology was important, or perhaps he never realized it. There is a real and positive message in this story. Not only is the psychology of introduction to the organization a vital matter but the engineer's introduction to the executive is just as significant. This lack of the "fifth ingredient" in the sensitive equilibrium of human relations can easily nullify the greatest willingness to co-operate, the most intelligent technical work and the high hopes of a useful contact.

There's Work For Everybody

PHILOSOPHERS are sometimes found in strange places. For instance, not long ago we ran across a couple of them in the improvised lunch room of a large chemical plant. In the company organization they were well-accredited representatives of the research and operating departments, but for the moment they were engaged in settling some of the momentous problems of society. Their conversation had gradually drifted to the subject of temperament and other human frailties. M. C. Whitaker's classic reference to the "prima donnas of the research laboratory" had been ably defended by the research chemist on the score that it was this peculiar quality of temperament that enabled the investigator to throw his body and soul into his work, to put forth his last ounce of energy in order to carry a research problem through to successful conclusion.

It was then that we heard from the operator, a big 200-lb. chemical engineer with many of the forceful characteristics of the illustrious Whitaker himself. "This temperament business," he said, "is all right in the lab, but it won't do here in the plant. If something happens and one of you fellows is yanked up on the carpet and get's his hair rubbed the wrong way, he can get mad, go home and stay there until he has forgotten what it was all about. But it's different with us. When the big boss comes down here and rides rough-shod over us, we've got to stand up and take our medicine and then go out in the plant again and get on the job. Somebody's got to keep those wheels going 'round and we do it whether we feel like it or not.

"You research chemists are like a bunch of race horses. You're fed and groomed and pampered for 6 months. Finally you go out and do your stunt and in 6 minutes it's all over and you're ready to go back again and browse around the library and the lab. We're truck horses out here in the plant. We've got to be big enough to pull the load, broad-backed enough to take our punishment—to get down and dig when the big boss cracks the whip. This is no place for your high-strung prancer. What we've got here is work, work and more work. And that reminds me, it's about time for me to get back now and find out why that blasted Cottrell is spittin' its sparks all over the north end of the acid building. So long, *Chem. & Met.*, come in and see us again some time."

Thus the dialogue ended—but not before our practical philosopher had driven home the logic of his views. There is work for all of us in chemical engineering production and our little differences in human make-up are only going to help us get into the places where we can do the most good for our companies and for ourselves.

Chemistry for Physicians

AN explosion of anesthetic gases in a Baltimore hospital resulting in the death of a patient undergoing an operation calls attention to the importance of a practical knowledge of chemistry by physicians and surgeons. According to reports ethylene and nitrous oxide were used as anesthetics, one report mentioning oxygen in addition to the two other gases. The explosion followed the application of an incandescent platinum wire to cauterize the wound after the operation.

It seems likely that the initial explosion resulted from ignition of an ethylene-air mixture by the hot platinum wire. Mixtures of this nature are flammable within the range of 3 to 22 per cent ethylene, while the temperature of ignition of ethylene in air ranges as low as 542 to 547 deg. C. It is evident that in the case under consideration a combination of conditions could easily have existed that would cause an explosion.

There is a further possibility that a primary explosion of ethylene might have detonated the nitrous oxide present. The decomposition of one gram-molecule of this gas liberates 18,000 cal. and is best brought about by detonation, being complete at 900 deg. C. Assuming that the ethylene mixture originally ignited at the lowest possible temperature, 542 deg. C., the resulting oxidation might easily have raised the temperature to the decomposition point of nitrous oxide and thus added to the force and violence of the explosion.

Speculation aside, it would seem as though the incident contains some of the elements involved in looking for a gas leak with a lighted candle. Customary precautions may have been taken, but evidently they were not sufficient. If press reports can be taken as authentic, the physicians expressed great surprise at the accident and were unable to offer a satisfactory explanation. If this is so, it reveals a degree of ignorance of the simplest elements of chemistry that calls for correction. It has been our observation that chemistry receives scant attention in the average medical school and that medical students are not deeply impressed with its importance. Many of them will admit that they "cut" chemistry whenever they can, and mature physicians will confess to an aversion to the subject during their student days and a lack of its use in their later practice. Without attempting to discover the reasons for this state of affairs, it is evident that a better knowledge of chemistry would prove valuable, and it is incumbent on medical schools to teach the subject more thoroughly and present it in a more attractive and practical manner.

Political Versus Economic Taxation

SO MUCH has been said, and so well said, about the Mellon plan of federal taxation that there would seem to be small need for reiteration. Yet the fact remains that economic principles and sound logic are not yet accepted as a basis of action by our legislators, many of whom are bound by local tradition, personal prejudice and demagogism. The country is confronted with a curious combination of conditions. The Mellon plan has had the indorsement of the press, of business and industry through the country. It is based on sound economic principles designed to obtain revenue for the government in the fairest and least burdensome manner. Outside the halls of Congress no voice has been raised against it. And yet the politicians thus far have thwarted the expressed preference of the people. The demagogue has triumphed over the able financial advisor of the government, and the small politician has successfully opposed his leaders, who are more responsive to the voice of business.

There is but one thing to do, and that is for responsible representatives of business and industry to continue to voice their approval of the Mellon bill and their disapproval of the proposed modifications. This can be done most effectively by direct communication with Senators and Representatives; and we urge upon executives of the chemical engineering industries the necessity of making their influence felt. Only by a preponderance of expressed opinion can the opponents of the Mellon proposal be defeated.

The arguments in favor of the Mellon plan have been emphasized over and over again, particularly in conection with a reduction of surtax rates. There is no mystery about the surtax, although it is the apparent stumbling block in tax revision. Mr. Mellon set the maximum surtax at 25 per cent because he estimated that at that rate capital would be disposed to consider investment in productive enterprise rather than take refuge in tax-exempt securities. At any higher rate the plan must fail.

The demonstrable facts of the case are these:

1. Taxes must be paid in cash. Accordingly they reduce the liquid assets of business that are so necessary to its safe conduct and expansion.

2. High surtaxes retard expansion and development of industry by greatly reducing the possible profits of commercial ventures. The investor, weighing these reduced profits against the possibility of loss, seeks investments of smaller return but greater security. Money is driven out of productive enterprise into tax-exempt securities.

3. National revenue from high surtaxes is declining year by year and taxes are being gathered more and more from men with modest incomes subject to normal tax rates. High surtaxes do not yield high returns to the government, and large incomes are not bearing the brunt of taxation. Consequently any proposal to retain high surtax rates is a fine political gesture against the wealthy, but yields no revenue. In spite of the plausible talk of the opponents of the Mellon plan, the criterion of tax revision is not the measure of supposed relief that will be given to the wealthy, but the amount of revenue that can be collected from them.

In a recent interview on the subject of tax revision Mr. Ford emphasized a point that has been made by Mr. Mellon and many of his supporters—that no national advantage can come from a policy of applying high surtax rates. The constructive value of private wealth is much greater than that of a swollen public treasury. Great fortunes in the hands of men like Ford will do more for the expansion of industry and the welfare of the country than the same amount in the hands of the government. Mr. Ford said that even if the government took 99 per cent of his profits he could still live comfortably on the remaining 1 per cent, but he contended that the private use of his money would do more for the country than the government could hope to accomplish if it took the money away from him in high taxes.

The elements of the situation are so simple that one almost despairs of their acceptance by men who refuse to see and who are bent on political ends. And yet we feel that nothing should be left undone to insure tax revision according to the Mellon plan.

An Opportunity for Soap Technologists

LOOKING over the field of technical societies in different industries, it is noticeable that no such association exists among soap technologists, and the question immediately arises whether there are not numerous technical problems in soap production that might be advantageously considered through the co-ordinated efforts of technical men throughout the industry. Certainly the experience of other chemical engineering industries is that the technical association is an asset of definite value in solving problems of common interest and putting production on a higher plane. Through the correlation of research and the free exchange of ideas every unit gains an advantage that reacts to the benefit of the industry as a whole. The soap industry, although one of the oldest in the chemical engineering group, has thus far been content with the old idea that individual aloofness is a safe and profitable policy. It is true that many of the larger concerns are conducting research on an extensive scale, but co-ordination of individual efforts through the clearing house of a technical association is conspicuous by its absence.

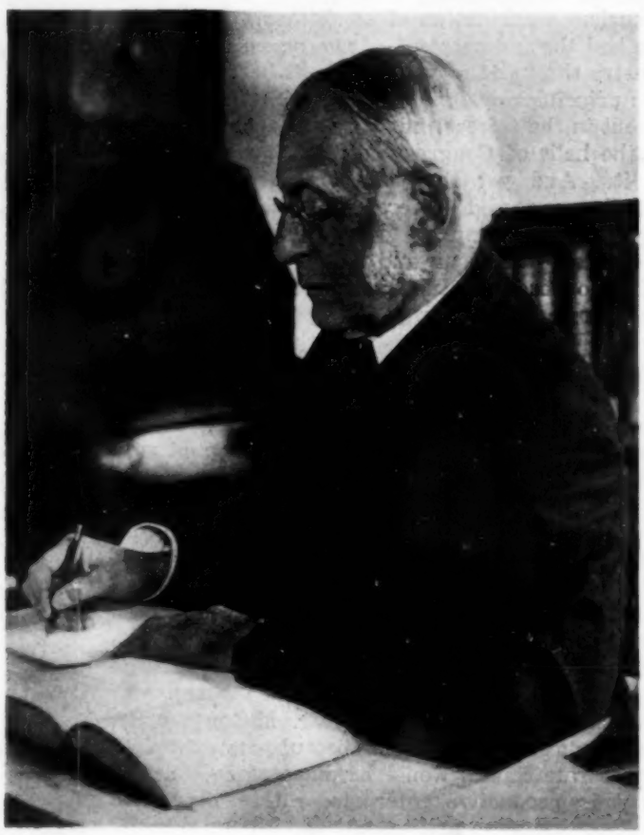
Among the related industries that have profited by the organization and support of technical associations, a conspicuous example is found in the paper and pulp industry. There is no denial that the members of the Technical Association of the Pulp and Paper Industry have realized tangible benefits from the reading and discussion of papers, the interchange of ideas and the organization of study and investigation of common problems. Individual viewpoints have broadened; the technology of the industry has been greatly improved and sound progress has been facilitated through the co-ordinated effort of the representatives of many mills.

Without attempting to indicate the variety and complexity of the problems in the soap industry that might well receive the attention of a technical association, we offer the idea on its broad merits, confident that individuals within the industry will readily perceive the work to be done and the benefit to be derived. There are more than 900 superintendents and managers directly engaged in the manufacture of soap. The value of the product exceeds $300,000,000 per year and represents the output of approximately 350 plants. It requires no stretch of the imagination to foresee industrial as well as technical benefits through a close association of the industry's technologists.

Eliot of Harvard—Chemist

A Former Teacher of Chemistry, Whose Distinctions in Other Fields Have Eclipsed His First Work, Celebrates His Ninetieth Birthday

Charles William Eliot



Charles William Eliot—chemist.

Comparatively few people of the millions who have heard of the distinguished president emeritus of Harvard realize that chemistry was his chosen profession. Yet from the time of his graduation from Harvard in 1853 until he became its president in 1869 he was a student, a research worker and a teacher of chemistry.

Last week there was a celebration in Cambridge, Mass., to congratulate this celebrated citizen on his ninetieth birthday. Ninety years. It is an amazing length of life, especially when coupled with great achievement and notable distinction.

From the viewpoint of chemical development President Eliot's ninetieth birthday has great interest to the chemical engineer. Chemistry in 1834, at the time of Eliot's birth, was little more than an interesting series of experimental novelties. Wöhler was just synthesizing urea from inorganic materials. The extension of chemistry to industry was little considered and such things as the chemical control of processes and the development of chemical engineering were of course not conceived. Even in his student days and in the years of his active teaching he had contact with a very different kind of science than the one he has watched grow out of those meager beginnings. In a recent letter to *Chem. & Met.* Dr. Eliot wrote:

"I recognize the fact that my early study and teaching of chemistry was a determining feature of my educational career, although in 1863 the field of industrial chemistry and chemical engineering was only beginning to be developed. What a splendid field it has now become! The field of biological chemistry has also enlarged prodigiously and is at this moment giving great promise."

There are two characteristics that would have made Eliot a great chemist had he not been called to other work. They have made him a dominant figure in the field of education and mark him as an example to follow. On the one hand a freshness of outlook, a willingness to experiment, a vision beyond the boundaries of status quo, and on the other an inexorably high standard of accomplishment.

These things combine to create a titan, whether the field be education or engineering, business or profession. They will not be denied.

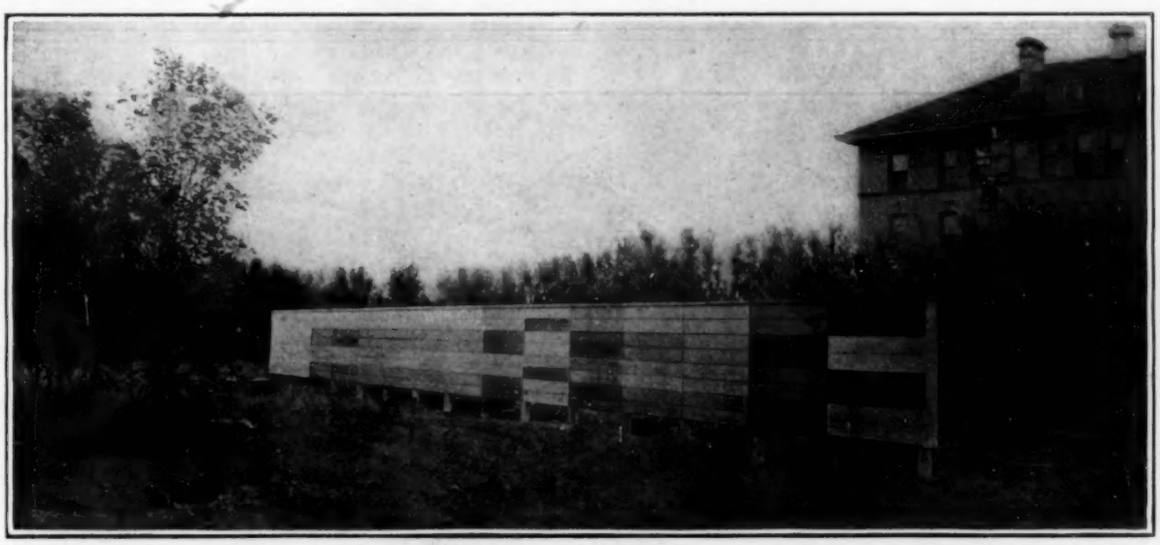


Fig. 1—The First Test Fences Constructed in 1906 at the North Dakota Experiment Station

Scientific Pioneering in Determining

The Protective Properties of Paint

For Almost Two Decades the North Dakota Agricultural College Has Helped to Blaze the Trail Toward a More Fundamental Conception of the Composition and Performance of Paints and Varnishes

By W. T. Pearce
Head, School of Chemistry, North Dakota Agricultural College

INDUSTRIES frequently operate for years before much is known concerning their technology, rule-of-thumb methods of operating and testing being used. As an example there was a dye industry before the first coal-tar dye was ever synthesized or scientific methods of application were developed. In a somewhat similar way the paint and varnish industries began. They are old industries that have supplied a number of essential products for centuries, and by observation and experience, superintendents and foremen learned how to perform certain operations surprisingly well.

It is only in recent years that chemists and chemical engineers were placed in charge. Gradually they have so changed manufacturing processes from the raw material to the finished article that uniform products are becoming the rule rather than the exception.

Few industries present so many physicochemical problems. Methods of investigations are being studied and probably no industry is more dependent upon research in pure science of the kind fostered by our universities than the paint and varnish industries.

This scientific work was in its infancy when the North Dakota paint law was passed. The researches initiated or stimulated by this law form a part of the chemical engineer's contribution to these industries. Methods of study were crude and superficial in many cases and erroneous conclusions may have been reached —yet such is the history of pioneer scientific work.

It is the purpose of this article to give the reader a brief outline of the work completed or in progress in the North Dakota Agricultural College. Numerous bulletins have been published and a bibliography will be appended in order that those interested may study the several investigations as thoroughly as they wish.

Along with the first paint legislation came questions concerning the relative merits of the constituents found in commercial paints. In order to answer them, test fences were constructed and paints representing a large number of formulas were applied and studied. Such fences were constructed in 1906, 1907, 1915, 1916, 1921, 1922 and 1923, inspections were made and the data published. In the case of the latter fences, annual inspections are now being made.

Since the passage of the law, state inspectors have each year purchased cans of the brands of paints sold within the state. These have been analyzed and the great improvement in the quality of paints sold should be partly attributed to the results of the test fences and to this analytical work.

Varnishes of various kinds have been exposed on panels and studied for several years. Systematic work began with a study of methods of analysis. In 1923 a rather complete series of representative varnishes were exposed and studied during the summer, fall and winter seasons. The results of these studies are being tabulated and published along with the composition and physical data for each varnish.

The original test fence, of fifteen sections, consisted of boards of soft pine and hard pine, with clapboard siding of cedar and soft pine. J. B. Campbell, report-

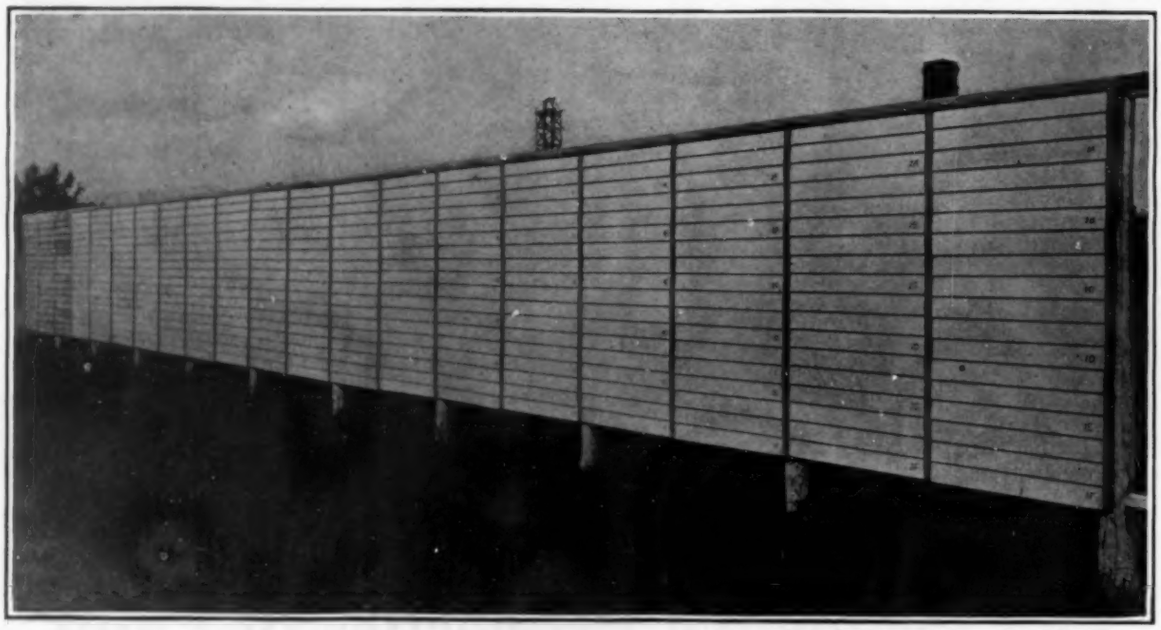


Fig. 2—The 1921 Test Fences Photographed 1 Year After Painting

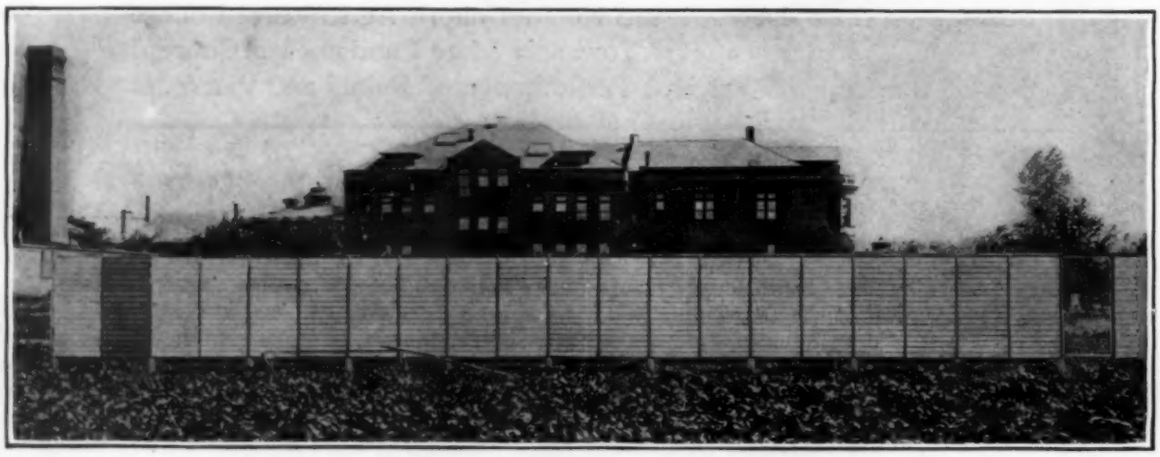


Fig. 3—The 1921 Test Fences Photographed 2 Years After Painting

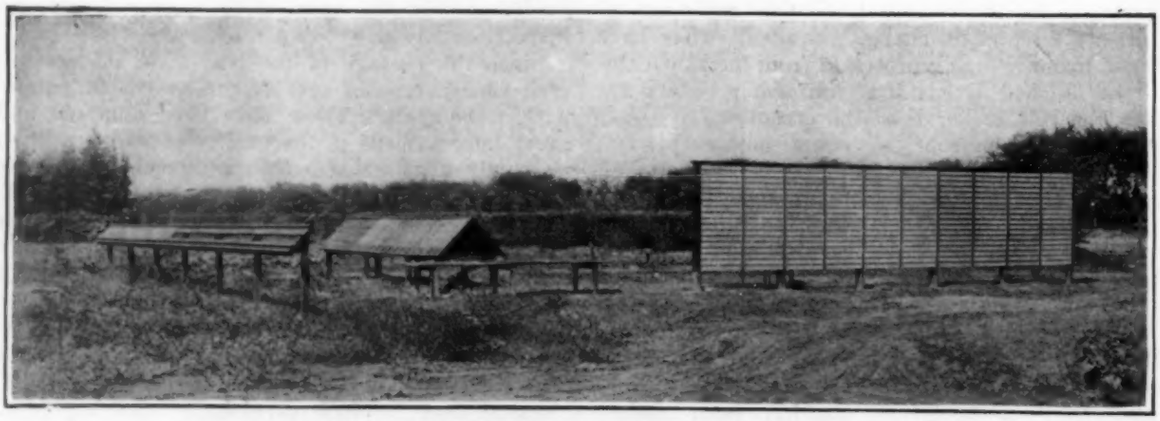


Fig. 4—Metal Fence Paint Tests, Varnish Racks and 1922 Test Fence

ing to the paint manufacturers upon the construction and painting of the 1907 test fence, said in part: "Twenty-one heavy cedar posts were set in the ground to a good depth, 6 ft. apart for each fence. After thoroughly tamping the dirt solidly around the posts, cement was used so as to protect the posts. These posts were cut down in order to conform in size with the studding used between the posts. The bottoms as well as the tops of the fences were protected by heavy timber. The bottom boards of these fences are 18 in. from the ground. The west sides of the fences were sided with heavy boards running lengthwise. The timber used on this side was Northern hard pine and soft pine. A perpendicular strip was nailed on the fences at each post. On the east side regular weather-boarding 3½ in. wide was used. Two kinds of weather-boarding were used—namely, soft pine and cedar."

Each paint was applied on the four kinds of lumber on both sides of the fence. The 1915-16 test fence was built in a similar manner. Each section consisted of three panels of six white pine clapboards each. Two paints were used on each panel, making three clapboards for each test. The area of painted surface for each test was 432 sq.in. This plan was used without modifications for the 1921, 1922 and 1923 fences. Panels on all of these fences face either east or west. The rate of perishing for the paints given an eastern exposure is so much slower than for those of identical composition given a western exposure that the writer purposes to use only one side of the fence in the future. Inasmuch as the greatest rate of perishing is obtained when the panels are facing south, all tests will be given a southern exposure. Single panels, 18x36x¾ in., will be used instead of the clapboards and a colored paint of great durability will be applied on the backs and sides of the panels.

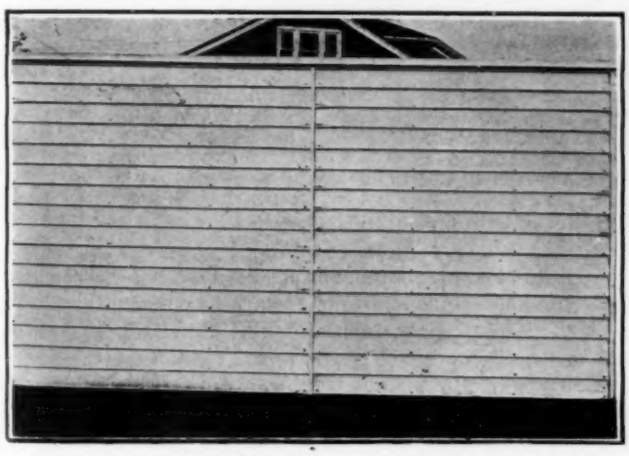
The varnish racks consist of frames built to hold 120 maple panels, 15x3x¾ in. These frames are facing south and are inclined at an angle of 45 deg.

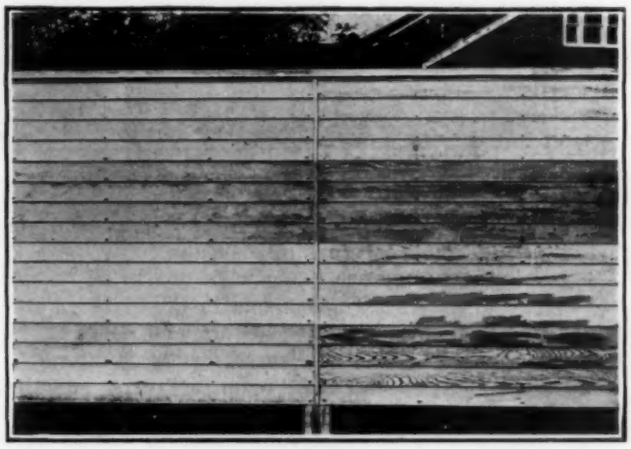
All paints were applied out of doors after the panels had been screwed to the frames. Good painting practices were followed for the application of the test paints. The varnish panels were coated and allowed to dry in a fume-free and well-ventilated room.

Formulation of Test Paints

The formulas for the 1907 series were supplied by George B. Heckel, secretary of the Paint Manufacturers' Association, and consisted of sixteen typical formulas. Paints were made in accordance with these formulas, and supplied in whites, colonial yellow and gray.

Four hundred and eighty formulas were used for the 1915-16 series. Each paint pigment was used in a great variety of combinations, in order to study the characteristics of each pigment, as well as to ascertain





Figs. 5 and 6—Close-Ups of 1906 Panels Showing Results of Exposure

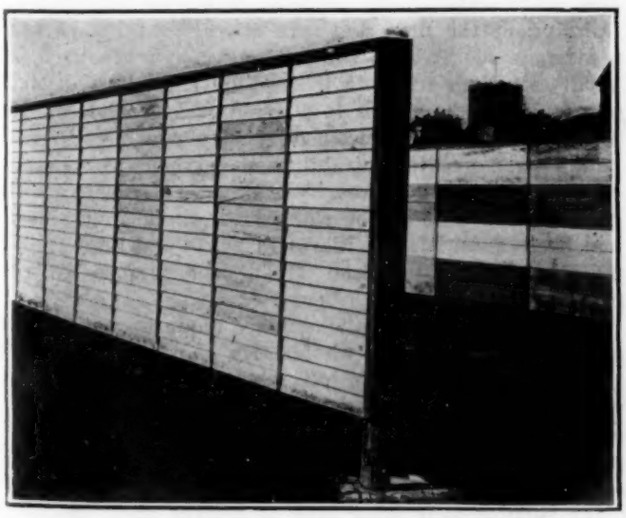


Fig. 7—The 1915 Fences After 5 Years Exposure

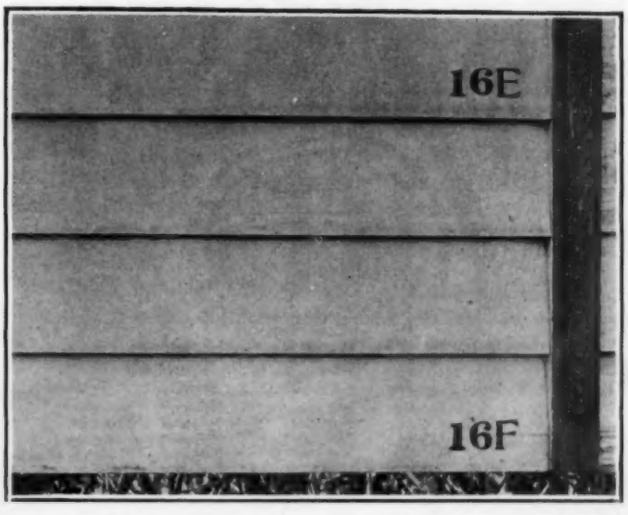


Fig. 8—Close-Up of 1915 Panel Photographed in 1920

the effects of one pigment on another. The relative value of different priming coats, the relative value of raw, refined, boiled and blown linseed oil when used with typical pigment mixtures, the relative value of perilla, china wood, soya bean, fish, cottonseed and corn oils for use in paint manufacture were investigated in this series.

These investigations were included in the 240 tests used on the 1921 fence. The newer white pigments, titanox, timanox and leaded zincs are being studied in a similar way on the 1922 and 1923 fences.

The quantities of oil used in grinding the pigments, the percentage of pigment in the mixed paint, quantities of oil and turpentine added to the mixed paint for the first and second coat work and other information of a similar nature have been tabulated in the published reports. Most of the paints were manufactured in the college experimental plant. The 1907 series, however, was manufactured in large plants and donated by the manufacturers' association.

Preliminary tests were made with nearly all brands of exterior and floor varnishes sold in the state. These were applied to the outside woodwork and floors of the college buildings by an experienced master painter.

In 1923, several varnish manufacturers supplied forty-five varnishes, that were representative of rubbing, interior, floor and exterior varnishes. These were supplemented by fifteen varnishes of similar type made in 2-gal. quantities at the college. The composition is known in nearly all cases, and the physical characteristics of each varnish has been carefully determined.

The 1906 fence was inspected in some detail and photographs were taken. It was repainted in 1910, to determine the condition of the surfaces for repainting. The 1907 fence was inspected in 1909 by committees representing interested associations and companies, and the college. The condition of the paint coat, whether chalking, checking or cracking, was noted, as well as the hiding power, color and condition of repainting. The 1915-16 fences were inspected in 1916, in 1918 and in 1920. The more recent fences are being inspected annually by the writer.

The varnish tests are inspected weekly, loss in luster, checking, cracking and water effect being noted. Tables I and II, which are sample reports of inspections, will show the nature of the data obtained.

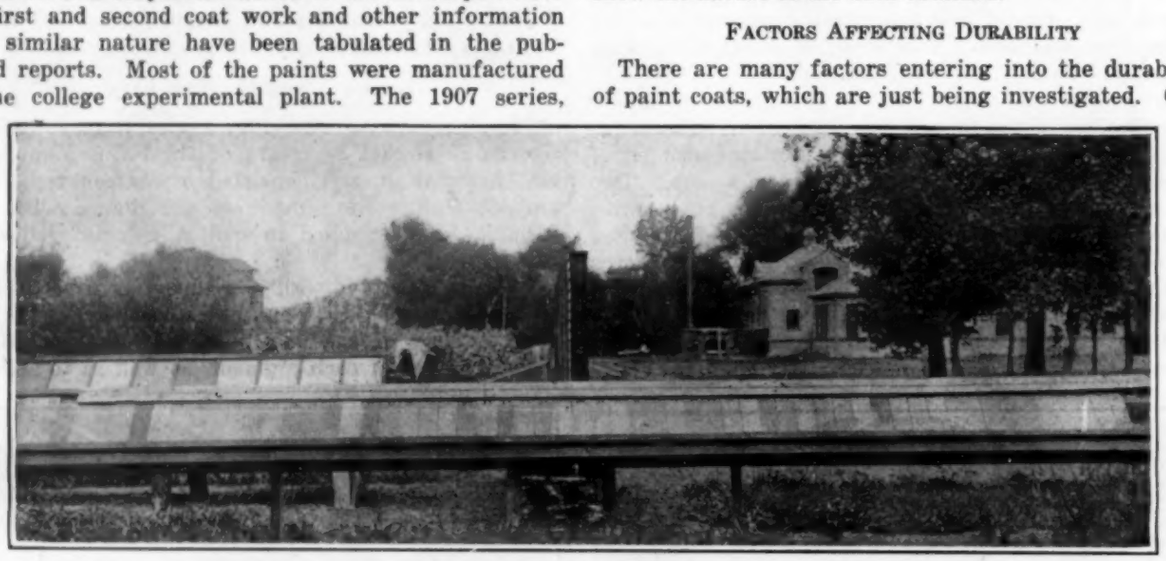


Fig. 9—Surveillance Tests on Varnish Panels of 1923, Photographed After 3 Months Exposure

Table I—Typical Inspections of Paint Fence

Paint Section 10A

Inspection, year of	1916	1918	1920
General condition	Good	Fair	Poor
Hiding power	Good	Fair	Poor
Color	Good	Fair	Fair
Chalking	Not any	Slight	Slight
Paint coat	Good	Fair	Poor
Checking	Not any	Not any	Not any
Cracking	Not any	Considerable	Considerable
Scaling	Not any	Slight	Considerable
Condition for repainting			Bad

Table II—How Varnish Racks Are Judged

Varnish No. 1

Days After Exposure	Luster	Checking	Cracking	Whitening
7	Good	Not any	Not any	Not any
14	Good	Not any	Not any	Not any
21	Good	Not any	Not any	Not any
28	Good	Not any	Not any	Not any
49	Losing	Fine	Not any	Not any
70	Losing	Some	Not any	Not any
98	Losing	Considerable	Some	Not any
119	Not any	Bad	Bad	Not any
133	Not any	Bad	Bad	Complete failure

Factors Affecting Durability

There are many factors entering into the durability of paint coats, which are just being investigated. Conditions of climate, quantity and the proper vehicle for each pigment are factors in the durability of any type of paint. For those reasons no attempt has been made to draw definite conclusions from most of the tests. It was thought that the tabulations of data from carefully planned and conducted tests would form a better basis for future investigations than the advancing of theories on the basis of tests where little understood variable factors are involved.

However, a few important conclusions were reached. Paints that gave good results when used on white pine and cedar scaled badly on hard pine, due to improper thinning of the first coat. In other words, more turpentine is required in the priming coat when used on hard pine than when it is used on soft pine. Ocher priming proved inferior to a priming coat made of the mixed paints, thinned with oil and turpentine. Tinted paints gave greater durability than the white paints of the same composition. The effect of zinc oxide in reducing the chalking of white lead was clearly shown and large quantities of inerts in white and light-tinted paints caused scaling and left a poor surface for repainting.

That semi-drying oils when used alone were not suitable for use in paints was clearly shown on the 1915 test fence. Soya bean oil when used in moderate quantities with processed linseed oils gave satisfactory results in many cases. Panels made with perilla oil gave excellent results.

Early varnish tests indicated that the durability of clear varnish over wood was dependent upon the percentage of oil contained in the varnish, excellent re-

sults being obtained from varnishes containing no fossil resin. The laboratory measurement of toughness using the kauri reduction method gave data that checked the durability tests very closely. Recent tests conducted with a great variety of types of varnishes lead to the same general conclusions, although varnishes containing similar amounts of oil differ considerable in durability and in value for toughness.

Investigation Continues

In addition to the recent 1921-23 test fences, which will be inspected annually until all tests have failed, exposures of roof, barn and metal paints have been studied and these investigations will be greatly enlarged in the near future. A study of automobile finishing varnishes—a subject of great interest at the present time—has just been planned. Coats will be built up upon automobile body steel panels, 18x36 in. Upon these about twenty finishing varnishes will be applied and given a southern exposure, inclined at an angle of 45 deg. The varnishes are now being tested for this work.

Along with this work a series of varnishes will be

Fig. 10—Paint Research Laboratory

applied over pigment coats of various kinds, in order to compare this durability over such coats with that obtained on unpainted wood.

A study of paint vehicles also is included. Linseed oils with varying viscosity, acid number, etc., have been made by refiners for this work. Typical paint formulas will be used with each oil.

Editor's Note: Those who are interested in the scientific study of protective coatings will find something of value in the following publications, which have largely emanated from the North Dakota Experiment Station:

E. F. Ladd, Bulletin 81, No. Dakota Experiment Station.
E. F. Ladd and E. E. Ware, Bulletin 92, No. Dakota Experiment Station.
Leo. P. Nemzek, Bulletin 31, Educational Bureau, Paint Manufacturers Association.
H. A. Gardner and others, Paint Bulletin 1, No. Dakota Experiment Station.
J. Theobold and R. T. Peters, Paint Bulletin 2, No. Dakota Experiment Station.
S. M. Evans and others, Paint Bulletin 3, No. Dakota Experiment Station.
John Dewar, Paint Bulletin 4, No. Dakota Experiment Station.
W. F. Washburn and E. F. Ladd, *Paint Bulletin*, vol. 1, No. 6, No. Dakota Experiment Station.
W. T. Pearce, *J. Ind. Eng. Chem.*, vol. 11, No. 2, p. 126; vol. 11, No. 3, p. 200, and vol. 12, No. 6, p. 552.
W. T. Pearce, *Special Bulletin*, vol. 1, No. 6, No. Dakota Regulatory Division.

New Fertilizer Regulations in Alabama

By W. D. Hurd
Director Soil Improvement Committee, National Fertilizer Association

IN THE recent codification of its laws relating to agriculture, mention of which has already been made in this journal, the State of Alabama has made some rather radical changes in its regulations regarding the sale of fertilizer. For the most part these are in line with the trend of the times.

Several states have in the past required a minimum of 12 per cent of plant food in a fertilizer. In its old law Alabama required 14 per cent and now raises the minimum to 16 per cent.

In its previous law Alabama required not less than 1.65 per cent nitrogen in fertilizers containing this element. The new regulations now require a minimum of 2.06 per cent nitrogen or its equivalent in ammonia.

Alabama also specifies the percentages of the different elements which must accompany the use of the terms "high grade," "extra high grade," "standard grade," etc. In case any reference is made to "grade" in connection with brand name or trademark the above terms shall refer to fertilizers—acid phosphate with nitrogen, acid phosphate with potash, or plain acid phosphate only when they contain not less than a total of 19, 18 and 16 per cent plant food respectively. No other "grade" terms are allowable.

These requirements should eliminate many low-analysis fertilizers, unprofitable for the farmer to use and for the fertilizer manufacturer to make, and also should reduce the multiplicity of useless brands.

There are also changes made in the administration of the law which have been shown to be desirable in the 40 years of experience which this state has had in dealing with these matters.

Alabama thus supports in a most effective way the campaign for high-analysis fertilizers.

Quicklime Specifications Recommended for Sand-Lime Brick Making

In the manufacture of silica brick, silica, preferably quartzite, is ground in a wet pan until the particles are of suitable size. Milk of lime is then added in quantities varying from 1.5 to 4 per cent CaO (based on the weight of the silica), and the shapes are molded and dried. When bone dry they are burned until most of the quartzite has been converted into tridymite and christobalite. Either quicklime or hydrated lime may be used.

The lime should be substiantially free from ash, dirt and core. Fineness of hydrate and rapidity of slaking of quicklime are desirable qualities.

According to specifications set forth in circular 153 of the Bureau of Standards, the quicklime or hydrated lime should conform to the following requirements as to chemical composition, calculated to the non-volatile basis:

	Per Cent
Calcium oxide (CaO), minimum	92.0
Magnesium oxide (MgO), maximum	3.0
Combined iron and aluminum oxides (Fe_2O_3 and Al_2O_3), maximum	1.5
Silica (SiO_2) and insoluble matter, maximum	3.0
Carbon dioxide (CO_2), maximum:	
(a) If sample is taken at place of manufacture	5.0
(b) If sample is taken at other than place of manufacture	10.0

Easy Money From Aluminum

A Review of Fast and Present Activities of Dr. Glen Lenardo Williams and the Promotion of the Williams Chemical Corporation, the International Aluminum Co. and the Detroit Aero Metals Co.

An Editorial Statement

SEVERAL times in the past few months the attention of *Chem. & Met.* has been directed to the operations of the Detroit Aero Metals Co., of which Dr. Glen Lenardo Williams is the moving technical spirit. On Jan. 11, 1924, in the course of an editorial field trip a representative of this magazine visited the plant of the company in Detroit, was shown about the works and given an explanation of the Williams process for making aluminum. Subsequently Dr. Williams himself submitted for publication in *Chem. & Met.* an articie purporting to describe and explain his processes for treating alunite for the production of aluminum, potash and ammonium sulphate.

This contact with Dr. Williams was strangely reminiscent of some of his earlier activities in the field of chemistry and metallurgy, which, as far as we are aware, profited no one except perhaps himself, brought loss and disappointment to investors and proved discreditable to the profession he represented. It is worth while reviewing briefly two of these earlier activities before giving attention to the present promotion.

It was early in 1918 when Dr. Williams first came to our notice through an advertisement offering stock in the Williams Chemical Corporation. At that time he was described as Dr. G. Len Williams and the corporation was organized to exploit his "far-reaching discoveries . . . consisting of new and special processes covered by thirty-two pending patents" for the manufacture of artificial gasoline, nitric acid, high explosives, alizarine dyes, artificial silk, non-fat soap and sugar. The advertisement carried a "view of Williams Chemical Corporation's plant at Bayonne, N. J.," and was couched in language that might easily deceive and mislead the layman, but which, to the technical engineer, branded the promotion as questionable if not fraudulent.

Sugar From Wood Pulp

According to the advertisement, Dr. Williams was to make "artificial gasoline from carbonates and water," at a cost of but "2c. to 3c. per gallon." Nitric acid was to be made "from air and water through the ammonia circuit." It was to be anhydrous and possess special qualifications for the manufacture of explosives, of which the company was to make "all kinds, including a new explosive." Alizarine dyes were to be made "under new processes for which improvements are claimed by Dr. Williams over German processes." Curiously enough, these dyes were to be "in many respects superior to aniline and other dyes," and the advertisement expressed the belief that "Dr. Williams is the only man in the United States today who is able to produce alizarine dyes." Among the other products of the corporation was to be an artificial silk of superior grade. Special attention was directed to "the non-inflammability of his product, its greater and more lasting luster, strength and elasticity." The estimated cost of production was not to exceed 50c. per lb. Non-fat soap was to be made "from what is now practically a waste product." This was deemed a special attraction on account of the high cost of fats during the war and the necessity for their conservation. Sugar from wood pulp was to be the crowning achievement of the company on the score that "sugar may be made from anything which yields alcohol, hence wood, from which wood alcohol is derived, may readily be employed to economically produce this important food."

The promotion literature played upon the cupidity and credulity of the possible investor by intimating that "ample government assistance, co-operation and protection" would accrue to the company through the exploitation of the Williams processes. Stress was laid on the fact that many of the proposed products of the company were "most essential to the successful prosecution of the war and conservation of foodstuffs," on account of which it was "deemed probable that large government financing will follow the initial installation of manufacturing units." The promotion was advertised by Paul A. Newman & Co., investment securities, 20 Broad St., New York.

The fate of the Williams Chemical Corporation is unknown, but it seems inevitable that the investors, if any, were duped and lost their money. Certainly the American market was never enriched by the marvelous products that Dr. Williams proposed to make at such slight expense. The promotion had all the earmarks of a typical chemical swindle.

Aluminum From Clay

The next public record of Dr. Williams' activities is to be found in the promotion literature of the International Aluminum Co., which established its plant at Nitro, W. Va. This company was organized in Detroit and incorporated under the laws of the State of Michigan with a capital of $1,000,000. Williams and his processes were the chief asset and the most was made of his "lifelong experience in the great German chemical plants, where he absorbed the wonderful German methods of solving the world's electrochemical problems." The point was emphasized, however, that Dr. Williams was born in the United States.

The promotion literature contained the customary loose talk about revolutionary metallurgical processes for the recovery of aluminum from clay. The startling announcement was made that "in the new process used at Nitro this alumina is taken out of the clay by a chemical process that is primarily heat-treatments" (*sic*). But this was not all. Valuable byproducts in the form of ammonium sulphate and mineral pigments were to be made to such an extent that they would de-

fray all cost of operations. The story had the old familiar ring—revolutionary processes invented by an obscure man of German experience; expenses to be defrayed from the sale of valuable byproducts hitherto unrecovered.

The possible profits from the plant "when running full capacity," according to the different pieces of literature published, ranged from $52,040 to $184,800 net profit per day. In the expectation of 300 days operation per annum a simple calculation showed that the profit to investors would vary from the modest sum of $1,561.20 to $5,544 for every $100 par stock in the company. The various references to patents indicated the ownership of fifty, fifty-eight and sixty-three patents granted by the United States.

Rouge as a Byproduct

While the International Aluminum Co. cannot be held responsible for other literature published on this process, the fact remains that it received a vast amount of publicity, presumably inspired, in the press. All of it had the same foundation—the wonderful processes of Dr. Williams for doing things that other technologists had hitherto been unable to accomplish. One of the choicest bits was written by Bernice Stewart for the Sunday magazine of the Detroit *Free Press*, Sept. 26, 1920. Of course Bernice is to be pardoned; she was merely doing her job, but she made it very clear that the new invention of Dr. Williams was to have startling consequences. "It means that the street cars on which you ride down to work will doubtless be made of a different substance; it means that the telephone wires which thread your land may be spun of another metal; it means that the radiators that heat your home will probably no longer be manufactured of iron." And more of the same relating to pots and pans, doorknobs, lighting fixtures, and even a new rouge. Detroit capital was complimented, furthermore, on being "the first to give the genius of Glen Lenardo Williams free rein." Apparently he took it and launched the Nitro enterprises with results that were finally disastrous. Not only were investors duped but technical employees lost their salaries and gave up in despair and disgust. As nearly as we can discover, the venture was a farce and a swindle from every point of view. After the collapse one of the employees who had personally assumed responsibility for meeting a payroll wrote to *Chem. & Met.* and exposed the whole miserable situation. Editorial comment was made in our issue for Aug. 16, 1922, under the caption "A 'Bucket Shop' in Chemical Industry."

This brings us down to the latest promotion with which Dr. Williams' name is prominently identified—namely, the Detroit Aero Metals Co., "manufacturers of aluminum, glucinum, light alloys, potassium carbonates and fertilizers." The best evidence of the unsound technical character of this promotion is to be found in the statement of Dr. Williams himself. As in the case of the International Aluminum Co., however, there has also been some promotion literature of questionable character. For example, there is a folder entitled "Cheaper Aluminum and Potash From a New Source," being a reprint of an article by Richard Hoadley Tingley in *Forbes Magazine*, Oct. 27, 1923. The folder bears the legend "Compliments of A. H. George and Charles E. Kocher, captains of the red team representing the Detroit Aero Metals Co." The article is full of loose pseudo-scientific talk and irrelevant matter on the importance of aluminum in the automobile industry. A subtle reference is made to Mr. Ford and his large requirements of aluminum, concluding with the statement that "he is still looking to alunite aluminum through the new process in which he is said to have a substantial interest."

Novel Nitrogen Fixation

The proposed business of the Detroit Aero Metals Co., when and if it gets into operation, is the production of aluminum, potash and ammonium sulphate from alunite. The avowed method by which production is to be accomplished is a weird combination of metallurgy, nitrogen fixation and industrial chemistry, the comprehension of which baffles the scientific mind. The statement of Dr. Williams is an incoherent and incompetent jumble of scientific and technical terms.

For example, after alunite is moistened with potassium carbonate and pulverized to 100 mesh, it is heated in an oil-fired rotary kiln in the presence of boiler flue gas to form potassium nitride and aluminum nitride! This simple and novel method of nitrogen fixation is facilitated by the fact that in utilizing boiler flue gas "the heat from such combustion forcing the nitrogen into high velocity and thus forming nitrogen into a form which is ready for fixation" (*sic*). During the treatment in the kiln the alunite liberates sulphur trioxide, which is later to be combined with ammonia, to be formed by treating the alleged nitrides in autoclaves with caustic potash solution. In the meantime potassium and aluminum have been behaving agreeably to form potassium aluminate, which is dissolved, filtered and treated with carbon dioxide to precipitate aluminum hydroxide. The latter is then heated in an oil-fired rotary kiln to form a novel compound of Dr. Williams' own invention, "aluminion," ($Al_2H_2O_2C_2$) "containing 2 hydrogen, 2 aluminums and 3 oxygens and 2 carbons," to say nothing of "some mechanical mixed free carbon which comes from the crude oil." It is to be understood that the oil burning under conditions of incomplete combustion forms free carbon and formaldehyde, "this formaldehyde losing its hydrogen to aluminum hydroxide and absorbing oxygen and moisture from it." Having obtained "aluminion" it is simply "placed into an electric furnace and reduced to a metal of very pure state." The potash in solution is recovered by evaporation and crystallization, a part of it being causticized for use in driving ammonia off from the nitrides. The chemistry of all this may be a bit obscure and unorthodox, but such is the Williams process. No circus ringmaster ever had better control of his subjects than Dr. Williams apparently exercises over atoms and molecules.

Comparatively little is known of this wizard of science. In the literature promoting his various processes he is featured as American born, of German parentage, having spent his infancy in Honolulu and obtaining his training and experience in Germany. His claims to versatility are matched only by his alleged patents, to which reference is made variously to the number fifty or sixty or eighty. Our own request of the U. S. Patent Office for patents issued to Glen Lenardo Williams brought only three, issued in 1920, 1921 and 1922, with the information that these are all that have been issued to him in the past 10 years. One of them (1,351,144) is for a method of producing aluminum by electrolyzing a solution of aluminum sulphate in fuming sulphuric acid at a temperature of 100 deg. C.! The

specification is a veritable nightmare of chemistry and metallurgy. Another (1,379,668) is for a process for making ammonia by heating aluminum silicon nitride to redness in a receptacle into which hydrogen is pumped to a pressure of 200 lb. The residue is melted to form aluminum silicide. The third patent (1,439,790) relates to a formula for a rust remover.

Electron Chemical Engineer

Some light may be thrown on the capacity and ability of the inventor by reference to his own letterhead. Here one is informed that Dr. Glen Lenardo Williams is an "electron chemical engineer." His specialties include the design and construction of electrochemical plants, investigation of physical and bacteriological processes, the manufacture of catalyzers and advice on catalytic reactions, information and research on the validity and infringement of patents, etc. On the left of the letterhead is an artistic lithograph of the world floating in space, surrounded by rushing electrons and flashes of lightning, with the information that "sub-electron relativity sustains the world." Perhaps it does, but it makes the Williams process no more intelligible or feasible.

Reviewing the record of Dr. Williams and his various promotions, the conclusion seems irresistible that he is a discredit to the profession of chemical and metallurgical engineering and a menace to industry; that his processes are technically unsound and commercially impracticable; that they have been the cause of loss to investors and disappointment to employees; and that in the interest of the public welfare he should be exposed and his promotions suppressed. It matters not whether he is merely incompetent and deluded or whether he has operated with fraudulent intent; the consequences to industry and the profession are alike disastrous.

"Phosphor Prints"

A New Method of Detecting Phosphorus Segregations in Steel

By Robert H. Canfield
Materials Testing Laboratory, Johns Hopkins University

DURING some tests of the methods described by Stead for detecting the segregation of impurities, especially phosphorus, in iron and steel, the writer was led to experiment on a modification of Stead's well-known copper reagent. The latter consists of a dilute solution (say 1 per cent) of cupric chloride in alcohol; it is applied with a wad of cotton to the surface, and acts by depositing a thin coating of metallic copper on those portions of the surface where the metal contains the least dissolved impurities.

The sulphur print is a familiar means of detecting harmful segregations of that element in steel. The accompanying article describes a method of making "phosphor prints" for detecting phosphorus segregations. It is almost needless to comment on the value of a rapid and accurate method of detecting a harmful condition when that method also provides a record of the test.

It occurred to the writer that a solution of a nickel salt might exhibit a greater selective action in being deposited on iron than would a salt of copper, since the solution pressure of nickel is only a little higher than that of iron. The idea was tried, and the expected selective action was very evident. However, the color of the nickel deposit did not offer a very strong color contrast to the rest of the metal, and experiments were made with mixed solutions of nickel and copper. These gave satisfactory results from every standpoint, and indicated variations of composition much more delicate than could be seen either with the plain copper coating or by heat tinting. Furthermore, the new solution is slower and more uniform in action, and its indications are always the same on the same metal. It was further found that the presence of ferric chloride in the solution has a decidedly beneficial effect.

An interesting but troublesome phenomenon in connection with the test is that the metallic nickel seems to act as a hastener of oxidation, due of course to its well-known catalytic properties, and the specimens must be rapidly dried with compressed air.

The composition of the solution finally arrived at is as follows: Nickel nitrate, crystals, 5 grams; cupric chloride, crystals, 1.5 grams; dissolve in hot water, 12 c.c.; ferric chloride, 6 grams; methanol, 150 c.c. To this may be added a cubic centimeter of nitric acid.

The amount of water present in the solution largely determines the speed with which it works, and it is desirable to have it work slowly. The specimen to be examined is ground to a flat surface on an emery wheel, and polished with flour emery on a duck-covered wooden disk, kept wet. It is then thoroughly rinsed and quickly dried, and immersed in the solution, which should cover it to a depth of a few millimeters. After about a minute and a half it should begin to show the effects of the plating, though some features may not be in evidence until after several minutes. Relatively pure and uniform metal takes the plating slowly. The color of the deposit shows a wide range, from purplish red to pale brown, while ghost lines and specks of segregation show up perfectly white. When the plating is complete, the specimen must be rinsed and quickly dried.

An interesting record of the result of this test may be made as follows: Soak a piece of Azo or other photographic paper for several minutes in a 5 per cent solution of potassium ferricyanide in water. Lay it face up on a piece of blotting paper and press the surface of the plated specimen against it, leaving it there for a minute. For this purpose the plating should be fairly thin. After rinsing the paper and fixing it in the usual manner, there is obtained a record in blue of those places which did not take the plating and therefore contain the impurities, presumably phosphorus. This process furnishes a companion to the well-known sulphur print, and the two together form a record of the two most undesirable impurities in steel such as can otherwise be obtained only at considerable cost and trouble.

Hot Formaldehyde Baths for Seed Potatoes

The hot formaldehyde bath treatment of seed potatoes for control of scab and rhizoctonia diseases is coming rapidly into favor in Minnesota, according to a plant disease specialist of the state university.

Cast-Iron Retorts For Low-Temperature Carbonization

Description of a System Designed to Permit Carbonization at Moderate Temperature and in a Short Time

By C. H. S. Tupholme
London, England

THE Tozer process of low-temperature carbonization is designed to produce a hard, smokeless fuel for domestic uses, employing a carbonizing temperature of 900 to 1,000 deg. F. in special cast-iron retorts. These retorts are constructed with the idea that the only way to obtain a hard, dense coke which will stand handling as well as or better than coal is to employ a fast rate of carbonization so that pressure is exerted on the swelling, pasty coal, thus compressing it into a homogeneous mass. At the same time facilities are provided for the rapid withdrawal of the gaseous and volatile products resulting from carbonization.

C. W. Tozer, the originator of the process, holds that to carbonize coal for the best results it should be subjected to a temperature around 1,000 deg. F. for 4 to 4½ hours. To carry out this method the coal must be carbonized in thin layers, owing to its low heat conductivity. Tozer first tried tubular retorts, beginning at 10 in. diameter. This retort was a failure, as was one of a diameter of 8 in., the reason being that the time of carbonization was too long. A 5-in. diameter tube brought him nearer success; but it was evident that batteries of 4½-in. or 5-in. diameter tubes would be out of the question on account of the space occupied and the labor involved.

The final plan, which was successful, was a retort designed so that the coal was distributed in the form of an annular ring. Employing one annulus per retort, the cubic capacity was too low, so a retort with a double annulus was constructed, the annuli being connected by radial cast-iron fins.

The present Tozer retort is shown diagrammatically in Fig. 1. This retort is built of cast iron, the annuli being concentric and each divided into four sections by the cast-iron ribs. The cylindrical space in the center is a gas passage between the upper and lower ends of the retort, so as to provide for the withdrawal of all the gaseous and volatile products from the top of the retort.

The cast-iron fins conduct the externally applied heat very rapidly to the inner annulus, so that, though part of the coal is 8 to 12 in. from a directly heated surface, the effect is the same as if only 2 in. away from a heating surface. The retort is slightly wider at the bottom than at the top to facilitate withdrawal of the coke and to prevent any tendency to stick. The retorts are heated by producer gas in recuperative settings.

In charging, the raw fuel is broken up into pieces of roughly 2½ in. cube and fed into the retort so that there are eight vertical columns of coal in each retort. The retort is heated to 1,000 deg. F. for 4½ hours. Maximum expansion occurs after 3½ hours, a slight contraction occurring when the heat has penetrated throughout the coal layers. This shrinkage naturally assists the discharge of the coke.

A high exhauster suction of 20 in. water is possible owing to the cast-iron construction, and this suction enables the volatiles to be withdrawn quickly. As seen from the diagram of the retort, evolution of these volatiles may take place in both directions, so that, since the retort is 10 ft. long, the maximum passage of the gases is through a layer of coal 5 ft. in depth. In addition to providing rapid removal of the gases, the exhauster action prevents the development of any excessive pressure. In fact, the Tozer retort is claimed to have overcome entirely not only the difficulties due to swelling of the charge but also the aggravation of this swelling by the formation of gases and liquids.

Due to this principle and the slight taper of the retort, there is no difficulty in discharging the fuel, which,

Fig. 1—Outline Sketch of the Tozer Retort

if it be a coking fuel, falls out in solid slabs 10 ft. high, corresponding to the full height of the annuli. The Tozer retort will carbonize any fuel from coal and shale to peat, and since the retorts are free to expand in every direction, there is no distortion. On the experimental plant, for instance, which has been operating more than 6 years, the retorts are in as good condition as when they were first installed.

The largest commercial installation of the Tozer plant yet made is for a concern in Natal. Here coal is carbonized in Tozer retorts, after which the residual coke is completely gasified, the gas being employed under gas-fired boilers.

The low-temperature plant consists of twenty-four Tozer retorts to treat an aggregate of 120 tons per 24 hours. The bench carrying these retorts is 75 ft. long, 17 ft. wide and 23 ft. high. The retort setting is regenerative, the sensible heat of the gases which have heated the retorts being absorbed by the secondary air supply. The amount of gas used to heat the retorts in 8 to 9 per cent of the raw fuel.

The retorts in this case are 12 ft. high, 3 ft. 6 in. diameter, and the charge per retort is 25 cwt. The retorts are heated by a mixture of producer gas and the gas from low-temperature distillation. The residual coke is discharged from the retorts to a sloping hearth, from here to conveyors and so to the storage dumps. The volatiles are carried away in a main connected to each retort by a short cast-iron pipe 7 in. in diameter. The suction throughout the plant is 20 in. water. The volatiles are treated in the usual way for tar and oils.

A typical yield by the Tozer process from 1 ton of coal analyzing 30 per cent volatile is given as:

15 cwt. low-temperature coke.
4,400 cu.ft. gas of 600 B.t.u. per cu.ft.
19 gal. oil of sp.gr. 1.06.
3.9 gal. motor spirit, including 2.6 gal. stripped from the gas.
12 lb. sulphate of ammonia.

In another case a ton of coal of 29.5 per cent volatile, 5 per cent moisture and 60 per cent free carbon gave a yield of 18 gal. of water free oil and 22 lb. of ammonium sulphate. The oil, on fractionation, gave per ton fuel charged:

Motor spirit	3.00 gal.
Intermediate oil	2.51 gal.
Fuel oil	8.50 gal.
Paraffine wax	8.00 gal.
Pitch	50.00 lb.

A typical yield of 1 ton of bituminous for a test run of 25 tons is as follows. The coal analyzed:

Water	2.10 per cent
Volatile matter	31.85 per cent
Fixed carbon	55.90 per cent
Nitrogen	1.93 per cent
Ash	8.40 per cent

Carbonization in the Tozer retort of this coal gave:

15.5 cwt. residual coke.
4,700 cu.ft. gas of 620 B.t.u. per cu.ft.
16.42 gal. oil.
19.8 lb. sulphate of ammonia.

The residual coke analyzed:

Volatile matter	10.34 per cent
Fixed carbon	75.45 per cent
Nitrogen	1.93 per cent
Ash	12.26 per cent

The crude oil obtained was fractionated into:

Up to 312 deg. F.	3.12 gal. motor spirit
312 to 617 deg. F.	8.00 gal. fuel and illuminating oil
Residue	75.4 lb. bituminous slack

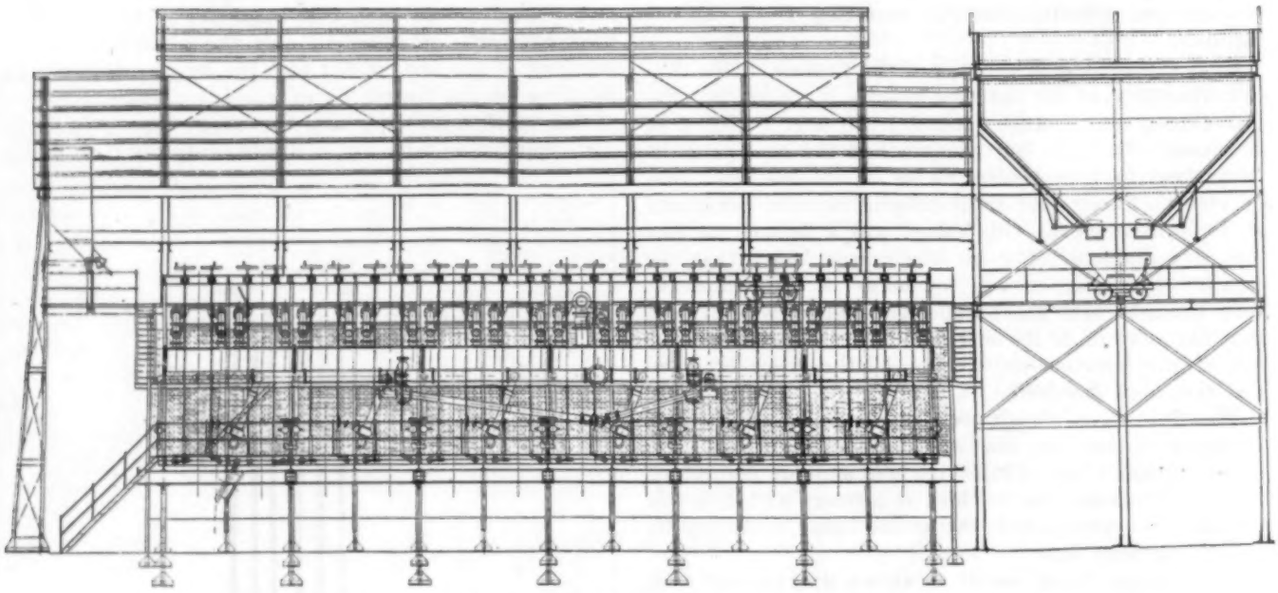


Fig. 2—Front Elevation of Tozer Retort Bench, Showing Retort House and Coal Bunkers

The average low-temperature coke from the Tozer process contains from 9 to 12 per cent volatiles, and ignites and burns easily in the ordinary domestic hearth. In most cases the resultant fuel has a calorific value slightly less than that of the raw coal; for instance, a coal of 14,250 B.t.u. gives a coke of 13,350 B.t.u. In some cases the calorific value of the coke has turned out to be actually higher than that of the raw fuel.

When gasified in a byproduct producer plant, this Tozer coke yields gas of 145 B.t.u., analyzing:

	Per Cent
CO_2	12.1
CO	18.2
CH_4	1.4
H_2	23.7
N_2	44.0

The yield from the 15.5 cwt. of coke was 124,000 cu.ft. of gas and 110 lb. of sulphate of ammonia. Total gasi-

fication of a ton of this fuel yielded 145,000 cu.ft. of 147 B.t.u. gas, analyzing:

	Per Cent
CO_2	12.25
CO	19.25
CH_4	4.10
H_2	24.55
N_2	42.85

The gas from the Tozer process has a calorific value ranging from 550 to 650 B.t.u. per cu.ft. After stripping, this figure is reduced to 400 to 550 B.t.u., with the extraction of 2.5 gal. of motor spirit per ton of coal. The gas is, of course, available for enriching a town's gas or for power or heating.

The crude oil fractionates as follows:

Up to 338 deg. F. .....6 per cent, sp.gr. 0.8
338 to 446 deg. F.....16.50 per cent, sp.gr. 0.9
446 to 578 deg. F. .....9.0 per cent, sp.gr. 0.97
518 to 662 deg. F. .....36.0 per cent, sp.gr. 1.04

From 22 gal. of oil thus fractionated, the first fraction, when combined with 2.6 gal. stripped from the gas, gives 3.94 gal. of high quality motor spirit.

The middle oils, up to 446 deg. F., have a flash point of 138 deg. F. and are excellent as Diesel oil or for fuel or illuminating.

The heavy oils, with a flash point of 118 to 178 deg. F., when combined with the middle oils, make good lubricants or Diesel oils.

These oils show from 10 to 20 per cent cresols, 5 to 8 per cent paraffine wax and no trace of either naphthalene or anthracene.

The maximum yield of motor spirit is obtained when carbonization at 1,000 deg. F. has taken place. In this connection some interesting experiments were carried out by Dr. Dunstan to determine when these oils lose the characteristics of olefines and pass over to the benzenoid series of aromatic hydrocarbons. Dr. Dunstan established that the turning point is about 1,400 deg. F., or the highest point the cast-iron retort will comfortably stand. It was found that the tar oils at between 1,200 and 1,300 deg. F. were heavier than at a lower temperature, being: wet tar, 1.085 at 60 deg. F., and dry tar, 1.10. The light oils given off by fractionation at 338 deg. F. gave 19 per cent of cresylic acid and 4.7 per cent of a combination of benzol and toluol.

World Production of Oil Shows General Increase

The American Petroleum Institute estimates the world's petroleum production in 1923 at 1,010,995,000 bbl., compared with 854,809,000 bbl., reported by the U. S. Geological Survey for 1922. The increase in 1923 amounted to 156,186,000 bbl., or 18.3 per cent.

The United States produced 735,000,000 bbl. in 1923, or 72.7 per cent of the total world production. In 1922 the United States produced 557,531,000 bbl., or 65.2 per cent of the world production in that year. The increase in the United States production in 1923 amounted to 177,469,000 bbl., or 31.8 per cent.

In 1923 the United States and Mexico combined produced 87.5 per cent of the world production, and 86.5 per cent in 1922.

Wherever possible 1923 production figures are official final figures or official estimates. In converting the figures of certain countries from tons to barrels, equivalents are stated in United States barrels of 42 gal., based upon the average specific gravity of the oil of each country. All the figures shown for 1922 are those reported by the U. S. Geological Survey. The tabulation follows:

	1923		*1922	
	Barrels	Per Cent of Total	Barrels	Per Cent of Total
United States	735,000,000	72.7	557,531,000	65.2
Mexico	149,472,000	14.8	182,278,000	21.3
Russia	38,167,000	3.8	32,966,000	3.9
Persia	25,000,000	2.5	21,909,000	2.6
Dutch East Indies	15,000,000	1.5	16,720,000	1.9
Roumania	10,850,000	1.1	9,843,000	1.2
India	7,575,000	.7	7,700,000	.9
Peru	6,375,000	.6	5,314,000	.6
Poland (Galicia)	5,000,000	.5	5,227,000	.6
Sarawak (British Borneo)	3,887,000	.4	2,649,000	.3
Venezuela	3,800,000	.4	2,201,000	.3
Argentina	3,250,000	.3	3,018,000	.4
Trinidad	3,087,000	.3	2,445,000	.3
Japan and Formosa	1,695,000	.1	2,042,000	.2
Egypt	1,037,000	.1	1,188,000	.1
France (Alsace)	503,000		496,000	
Colombia	426,000		323,000	
Germany	354,000		319,000	
Canada	175,000		179,000	
Czechoslovakia	100,000	.2	120,000	.2
Italy	32,000		31,000	
Algeria	9,000		9,000	
England	1,000		1,000	
Others	200,000		100,000	
Total	1,010,995,000	100.0	854,809,000	100.0

* Figures for 1922 are those of the U. S. Geological Survey.

Use of Honey as an Anti-Freeze in Automobile Radiators

By T. P. Gladston Shaw and G. Leslie Robertson

Owing to the increasing publicity being given honey-water mixtures as anti-freeze for automobile radiators and to the importance of such a large market as general use in this field would create, it was determined to make scientific tests of the properties of various possible mixtures.

These were made up as indicated and the results of the tests are shown in the following table:

Mix No.	Per Cent by Volume Honey	Sp.Gr. Baumé 15.5° C.	Relative Viscosity Water @ 4° C.=1 0° C.	−5° C.	−10° C.	−15° C.	Crystallisation Point 0°c.
1	10	6	..	....	....	....	.....
2	20	11	..	....	....	....	.....
3	30	16	..	....	....	....	.....
4	40	21	..	....	....	....	.....
5	50	26	6	8.2	....	....	−9.5
6	52.5	27	9	13	18	.....	−12.5
7	55	28	..	....	....	....	.....
8	57.5	29.5	11	18	27.3	43.8	−15.3
9	60	31.5	..	....	....	.....	−15.5
10	62.5	32	31	48	95	....	−15.5
11	63.5	33	..	....	....	....	.....

These data have led to the conclusions that:

1. The specific gravity of honey-water mixtures varies directly with the concentration of honey.

2. The relative viscosity of honey-water mixtures to that of water at 4 deg. C. is high and increases rapidly with increase in concentration of the honey or decrease in temperature. In the latter case this increase of viscosity is more rapid with the heavy mixtures than for the lighter ones.

3. The observed crystallization temperatures are in every case much higher than is commonly believed. Overheating of an automobile engine causes evaporation of the water, which if continued too long results in the formation of candy-like deposits in the bottom of the radiator. This is the result observed in actual running tests with various makes of automobiles.

4. The expansion on crystallization is less than that of water. In the particular case studied it was only one-tenth that of water. This is one point in favor of honey-water mixtures.

The authors believe that honey-water mixtures are entirely unsuitable for use by the general public as an anti-freeze in automobile radiators.

Putting Rubber Latex to New Uses

Brief Outlines of Methods for Impregnation or Coating of Fabrics, Wood, Stone, etc.

By Rudolph Ditmar

THE RUBBERIZING of fabrics has become difficult, and in some countries almost impossible, owing to the high cost of such rubber solvents as benzene and carbon bisulphide, carbon tetrachloride, etc. Now that latex is on the market, rubberizing can be carried out by the direct use of latex, without solvent. This is done in a process developed by the author on the ordinary machine used in the older process for spreading the rubber over the fabric. If the compounding ingredients are in a sufficiently high degree of dispersion—that is, if they are colloids or in colloidal solution—when added to the latex, they will remain in suspension.

Samples of colloids in colloidal solution, such as carbon black, oil, zinc oxide, etc., were supplied by Plauson. These solutions can be readily mixed with latex without causing precipitation of the colloidal substances added. Mixtures of aqueous colloidal solutions (hydrosols) with latex are very suitable for rubberizing. After the latex has dried, the rubberized fabric can be vulcanized cold; or if colloidal sulphur was previously added, it can be vulcanized hot.

One interesting application is the rosin-rubber high luster rubberizing method. This is carried out by emulsifying a colloidal aqueous rosin solution (rosin hydrosol) with latex, adding colloidal sulphur if necessary. One spreading on the fabric is sufficient to give a very shiny product resembling oilcloth. By using a mixture of latex, rosin hydrosol, oil hydrosol, zinc hydrosol, etc., in widely varying proportions, a great variety of properties can be imparted to the rubberized fabric. Thus it can be made soft, elastic, flexible or brittle as desired. In both cold and hot vulcanization of the oil gel that is formed, a slight factice formation occurs, which imparts a luster similar to the varnish used for rubber overshoes. Thus latex provides a way of making the finest rubberized fabrics with one spreading in the cheapest and simplest way and without the use of expensive organic solvents.

Using Latex to Preserve Stone

So far, studies have been made of the preservation of sandstone, gypsum, plaster and concrete. The best results were obtained with plaster and sandstone. In these cases the size of pores of the material is the most important factor. Coats of plaster or pieces of sandstone that are very porous or have large pores require concentrated latex; those that are less porous or have smaller pores must be treated with a more dilute latex.

The property possessed by latex, as a coarse aqueous suspension of rubber globules, of being miscible in all proportions with colloidal aqueous (acid-free) rosin solutions, fortunately makes possible the preparation of any desired rubber-rosin mixture. Thus in the impregnation and preservation of stone, the mixtures can be adapted to the physical and chemical nature of the material to be treated. Preservation with rosin is not new, and neither is the use of organic rubber solutions. Preservation with aqueous rubber or rosin solutions, however, is new. So also is the combination of these solutions.

In order to make the joints of water pipes water tight, it is customary to pack the threads of the joint with oakum dipped in a paste of red lead and linseed oil. This method works very well, but owing to the present prices of red lead and linseed oil [in Europe] it is expensive. The writer's method of making such joints water tight works equally well, and is considerably cheaper.

Taking advantage of the adsorbing power of oakum for latex, the fibers are soaked in concentrated or dilute latex or a mixture of latex with other colloids. The soaked oakum is wrapped wet around the threaded pipe end; when the joint is screwed together, the excess latex is squeezed out, and rubber is precipitated and forms a water-tight connection.

Wood May Be Waterproofed

Latex is particularly suitable for waterproofing wood by impregnation. Depending on the concentration of latex and the kind of wood, penetration of 1 to 3 mm. can be attained. For most purposes this is quite sufficient, since this much protection completely prevents the water from penetrating to the interior of the wood. The chief advantage of impregnating with latex is the elasticity of the coating. Wood retains its life as long as it lasts, no matter how dry it may become. The pores enlarge with rising temperature, which makes the wood more hygroscopic and more receptive to spores. It is true that some of the known impregnating agents (such as rosin) stop up the pores and are adsorbed by the wood; but they do not have the same coefficient of expansion as the wood. When the temperature falls, such a material is squeezed out of the pores; and, on account of its stiffness, it does not go back when the temperature rises again. This causes cracks and crevices that destroy the effect of the impregnation.

Impregnating agents of another variety (petroleum distillates and oils) evaporate in time and lose their effectiveness. The best of them all (tar) runs back into the pores when the temperature rises again; but its color and its stickiness make it useless for some purposes (furniture, etc.). Latex works much better. The precipitated rubber not only completely fills the pores but on account of its elasticity it withstands all changes in the wood due to temperature changes. Various methods have been tried for impregnating both hard and soft woods. Of them all, the following procedure was found to be the cheapest: Wood that has been dried as thoroughly as possible is heated for some time to 100-130 deg. C. While still hot it is dipped in latex and allowed to remain for 20 minutes after it has completely cooled. When removed after thus adsorbing latex, the wood shows some coagulated rubber on the surface. This must be scraped off with a blunt piece of wood.

Soft woods are easier to impregnate than hard woods, for which the latex must be diluted according to the hardness. With soft woods the latex can sometimes be used even in concentrated form. Wood impregnated by this method has a remarkable fatty feel and a high luster and repels water. It will also take varnishes, as in the case of wood for furniture, etc. By adding organic dyes to the latex, pleasing colored effects can be obtained. Very good waterproofing results are obtained by extracting the wood with organic solvents and then impregnating with latex; but this method is more expensive. Wood impregnated in this way can even be vulcanized, preferably by the cold process.

What Machinery Is Necessary for

The Management of Industrial Research

The First of Three Articles Discussing Various Phases of Industrial Development Work—The Building of Esprit de Corps Is the Subject of this Section

By J. M. Weiss and C. R. Downs
Consulting Chemical Engineers, New York City

AN INDUSTRIAL laboratory, be it chemical or mechanical, must, to be truly successful, be a vital organism and an essential part of a living entity—the industry. It must play the part of the heart of the industry rather than an ornamental headdress for advertising purposes. If viewed as an attractive outlet for easy money rather than as an essential element of industrial success, it is doomed to dismal failure at the next turn of the wheel. It must be symbiotic, not parasitic. Experience has shown that the successful accomplishment of development work is not a thing of immediate attainment. Development is an investment of the long-pull type and must be prosecuted irrespective of the condition of the current business cycle. Without a proper vision, development mistakes are bound to occur, and as a result, development staffs become overexpanded during prosperous times and reduced to a negligible status when the business cycle reverses. Such opportunism is regrettable, as both industry and the technical profession suffer simultaneously. Not only must an industry with vision prepare a uniform development program, but it must also provide against the senility and decay that are a possible result of a development organization which neither expands nor contracts in size.

The three articles we present to our readers under this title consist of excerpts by the editors from three chapters in a book that is soon to be published, entitled "Development Organization." Messrs. Weiss and Downs are eminently qualified to discuss industrial research and development, but they have done a far greater service than merely this. They have discussed with frankness and understanding the many perplexing phases of the technical man's relationship to the organization. It is a book that will have a strong appeal to every executive.

To obviate such a result, the authors believe it is necessary to provide for the progress of men through and out of the strictly development work to other positions in the general organization and to circulate a part of such men back through the development department. Because of the rapid technical advances of modern times, it is necessary for production men to keep step with such advances. Co-operation between development and production is at best difficult, but a proper application of the above principles will help to make it really effective. This progression and recirculation of men is the life blood of the industrial organization.

Esprit de Corps

Complicated organization charts might be presented at this point, but these could not possibly be applicable to the varying conditions found in industry. Charts are sometimes useful, but it must be remembered that, just as a picture of an apple is not edible, likewise an organization chart is not an organization. An organization, in the true sense of the word, has the quality of that vital spark which differentiates "the quick from the dead" and which may be called "esprit de corps." Although we all know what esprit de corps means, yet it is almost impossible to define except by its effect. It is the spirit of enthusiasm and loyalty in the rank and file, responding to the management's treatment of them as men rather than as machines.

One of the important things in this connection, especially in a research laboratory, is the trust placed in the men. Shall there or shall there not be internal secrecy regarding the work going on?

This has been a much-discussed question in research work in the past. We believe that the system of secrecy has been tried and has failed. Properly controlled discussion among the members of the organization should certainly be allowed. Dr. S. R. Scholes has discussed this subject with the authors as follows:

Concerning the subject of secrecy. In my opinion, more is gained than lost, where the men are chosen with honor and integrity as prerequisites, by allowing and even expecting casual visiting between laboratories, discussion of the separate problems and the announcing to each other of their results and discoveries. Where men are working in adjoining laboratories, such exchanges can hardly be prevented, except by hard-and-fast rule, and then you have the feeling of each man that, since he is not supposed to know, he cannot expect to keep the news to himself if he gets it. The ideal is a sort of fraternity attitude—free discussion and debate and sharing of confidence within, but a strict silence to the outside world.

You remember the parable of the woman who had the luck to find a trade dollar while she swept the back stairs? She gave a party to announce it. If she had been a member of a large and happy family they would all have enjoyed the news and not have thought it worth while hunting up the neighbors. And a laboratory man with a nice new "hunch" or some encouraging results always feels like telling somebody. Now, if he has with him a group of interested, understanding men who will gladly hear his news and probably help use his information or idea, his "rooster" instinct is satisfied and he need not say a word that would hurt his employer's interests.

To be sure, some men can work like monks in cells, needing no outlet for enthusiasm and having no inlet for the other man's. But such are rare. Also it is not neces-

sary or desirable to urge the men to talk except to their associates on the particular job and their chief.

Dr. Scholes' remarks refer particularly to the Mellon Institute, to which different corporations have submitted problems for solution. In such a laboratory there is greater need for internal secrecy than in the usual corporation laboratory.

Innumerable opinions favor a plan of this type. Dr. A. D. Little says in this connection:

> In striking contrast to the secrecy maintained between individual workers in large German research laboratories is the almost universal custom in America to encourage staff discussion. In the General Electric Laboratory, so in many others, the weekly seminars and constant helpful interchange of information have developed a staff unity and spirit which greatly increases the efficiency of the organization and raises that of the individual to a higher power.

The authors' own experience has favored a somewhat intermediate course. Certain key men in the department should be formed into an operating committee where general discussion is fostered. But it is not recommended that discussion of problems among the men in general be encouraged. The members of the operating committees should have been with the company long enough to have demonstrated their loyalty. It is advisable to admit new members to this committee from time to time. Admission to this committee will be esteemed as a mark of approval of the work and loyalty of the men and will be striven for. Something of this kind is needed to broaden the viewpoint of the men in the larger affairs of the company, for their actual contact with them is too often very slight; moreover, esprit de corps is developed by the creation of a council of this sort. This organization is intended to discuss questions that are more confidential than could be considered at the more or less public meetings of the laboratory seminar type. It has been found very advantageous to have representatives of other departments, approved by proper authorities, meet with this committee for the discussion of problems.

Technical Men and Technical Meetings

It is naturally impractical for a company to send many men to general scientific meetings, most of which are held at a considerable geographical distance from any one point. It is desirable, in a large organization, to have a reasonable proportion of the men who are in responsible charge of development attend such meetings and keep closely in touch with new developments in other fields, not so much through the papers presented as through contact with other men attending. When such a general meeting is near the city in which the laboratory is located, it is good policy to encourage as many as possible of the chemists to attend a part at least of such sessions and thereby emerge from the restricted viewpoint of a single industry into contact with men of varied and broad interests. This can always be done with local meetings of societies and it is, indeed, a healthy sign when each such meeting sees a large proportionate attendance from the members of a particular organization. Such organizations do not get into ruts, and the viewpoint of the individuals becomes broader, not only from the new ideas imparted by the papers or addresses but more from the mingling of the chemist with his fellow workers in other fields and the natural interchange of ideas. The executive who also attends must meet his assistants on a plane of absolute equality; by so doing he engenders and heightens the spirit of the individuals, thereby contributing in no little measure to the esprit de corps of the organization.

Contracts With Technical Employees

The attitude of the management toward the men is often reflected in the type of contracts offered to technical employees. In some cases these are unfair and oppressive and destroy proper spirit, containing clauses of the following type, which are not mitigated or modified by other clauses:

> Said second party agrees that he will not, at any time during this employment, disclose to any person, except to his superior and immediate associates in the company's employ, as necessary in the regular course of business, any information regarding any apparatus, process, formula, manufacturing feature, *at any time owned, used, discovered, developed or investigated by the company*, and that he will not at any time after the termination of his employment use or disclose to any person any such information except such *as has been published in generally accessible form.*

There have even been cases where the employee agrees to certain very restrictive arrangements, such as the above, and where the employer is not bound to fulfill any obligation to the employee either during the period of employment or after its termination. Such agreements should not be dignified with the term "contract"; indeed, they are practically unilateral.

No self-respecting technical employee should be asked to sign such agreements, which, should they be upheld by the courts, would take away his means of livelihood forever. A chemist's stock in trade is his experience, and his experience should be his to use in accordance with established professional ethics. An opinion has been expressed by Judge Taft [Cincinnati Bell Foundry Co. vs. Dodd, 19 Weekly Law Bulletin (Ohio) 84] as follows: "It would be a violation of every right of an employee of a manufacturer to prevent the former from using, in a business of his own, knowledge which he had acquired in the employ of the latter when he might have acquired such knowledge in the employ of other manufacturers." His patents and inventions should belong to his employer and this should, in most cases, be adequate compensation for the employer.

A Suggested Contract

The authors' idea of a proper technical contract has, following a statement of the salary, the term of notice mutually agreed and a provision that salary increases do not terminate the arrangement, a clause substantially as follows:

> That, on account of being engaged in work of a technical nature which may involve discoveries and improvements in machinery, processes and formulas, the said John Doe will, at the request, at any time and at the expense of the company, its successors, assigns or nominees, execute any and all applications for letters patent, copyrights or trademarks for the United States and any and all foreign countries, covering any discovery, invention, copyright, trademark or process that he shall discover as a result of and during the period of employment by the company and within 3 months thereafter; and he will execute any and all papers necessary and proper to obtain such letters patent and will vest in the company the entire right, title and interest in, to and under any and all letters patent, copyright or trademark that may be granted to him on account of said discovery in the United States and any and all foreign countries.

This seems fair and equitable and experience with this form of contract was absolutely and entirely satisfactory. No more is really needed to protect the company where it really needs protection—viz., the assign-

ment of patent rights. In one instance injustice was done to the employing company. This, however, was solely due to the delays inherent in American patent procedure, particularly in interference proceedings. Had it been possible to expedite these, the employer would not have been injured. Such cases are, however, unusual, and the injury is a temporary, not a permanent, one. In fact, a survey of the practice of a number of the more progressive and enlightened chemical concerns reveals that there is less and less tendency to contract with their technical men, but instead merely to have the fact clearly understood that inventions are the property of, and that patents are to be assigned to, the employing company. The American Institute of Chemists has recently appointed a committee to study the question of contracts and we may expect in the near future that a tentative form will be proposed that will be acceptable to employee and employer alike.

Protecting Trade Secrets

No inclusive definition can be given for the term "trade secret," as each specific case must be reviewed in all of its details by trial and the findings of different courts have often been at variance. Moreover, in most cases in the past, the judgment concerning the validity of a trade secret has been arrived at only after a complete description of the process or formula has been given and this action automatically nullifies the process as a trade secret thereafter. As a matter of fact, there are few trade secrets that remain secrets for any length of time, because of the rapid advance of all technical arts, and oftentimes the formula so carefully guarded in the sanctum of one company is likewise preserved with the same care in most of its competitors' archives. Processes and formulas known to many men in a plant, who are not concerned directly therewith, can hardly be classed as trade secrets. Some corporations have attempted to define as trade secrets practically all operations in their different plants; the result is confusion. To protect the employer in the very few cases where trade secrets are of vital importance, technical men, in general, should not be coerced into signing one-sided agreements that are indicative of mistrust by the company and breed real disloyalty among the men. The rule of reason is better than the rule of fear.

The manufacturer can, in the majority of cases, protect himself by patents, and, if he decides not to exercise this right of protection, as supplied by the public for the ultimate benefit of the public, he must thereby assume the responsibility if he loses his advantage. If such a decision is made, the manufacturer must be very careful to impress upon each employee each specific secret with which he is intrusted and not weaken his own position by claiming that all manufacturing information in his plant is secret and unknown to other manufacturers.

Although, in the vast majority of cases, products made under secret formulas enjoy only a fugitive freedom from imitation, there are certain cases where imitation can be made sufficiently difficult to provide ample protection from competition. Ample protection may be defined as providing for the economic success of the product. Imitation consumes time in direct proportion to its difficulty, but the economic success of the first producer affords a greater proportionate advantage as the time element enables him to enter fresh fields, establish his reputation, and use the time advantage over his imitator to improve his own product.

There are two ways of defeating the dissemination of secret information to competitors: First, by the possession of satisfied and contented employees, or second, by the extreme methods of German economists, who propose legal restraints whereby workmen assigned to manufactories are not only forbidden from shifting to the employ of a domestic competitor, but are even prevented from emigrating from the country. Such industrial serfdom reflects the militaristic qualities of German training, and, although admittedly efficient and operative for the Teuton, is decidedly repugnant to Anglo-Saxon tastes. The result is certain to foster classism, which is the tendency of all middle Europe.

A modification of the second method is to separate the steps in a process and allow no intercourse among those employed, but this plan is doubtless also impractical in the United States. It is felt that the first system of satisfied employees is the only one that will stand the test of time.

It is apparently only in unusual cases that there are real trade secrets to be considered, and in these cases a special, complete understanding should be reached by both parties as to the nature and limitations of the secret in question. If possible, this should be reduced to writing, in specific form, and not in general blanket terms. It is difficult to protect a trade secret against bad faith, but at the same time it is necessary to safeguard technical men properly, as bad faith can conceivably be practiced by the company officials as well as by the technical men.

Status of Technical Men Below Other Professions

During the design of a new plant or the improvement of old processes, apparatus manufacturers many times know what the apparatus is to be used for, and often this is desirable in order to take advantage of the special knowledge of the manufacturer and to obtain his co-operation. But rarely are such machinery makers placed under any agreement limiting the use which they may make of the information gained. This is, on the face of it, unfair discrimination against the employees of the operating company.

If the technical professions—chemistry and engineering—are to be raised in the public mind to the high standing of the legal and medical professions, the technical men must concern themselves with the means for its accomplishment. Lawyers are consulted by manufacturers on problems of vital importance, and their professional standing is the qualification governing their admission to the innermost secrets. Doctors are informed of the family history and must, to function properly, be the confidants of the patients. The public trusts the integrity of these professional classes and makes a full confession of its industrial and physical ailments. Complete process details and all related information are given to consulting patent attorneys and patent applications are drafted. Occasionally, there may be information that is not mentioned in the procedure before the examiner but which would prevent patent protection if known to the latter. The attorney is rarely placed under contract to hold these matters confidential, which, if divulged, would result in large financial loss.

This survey of the contract problem has shown that salesmen are placed under contract much more rarely than scientific workers, and that they quite frequently enter the sales forces of competitors. Their knowledge

of customers' lists, discount rates, volume of sales, etc., arm them with the power to harm their past employers. It is generally conceded that their experience is theirs to use in making a living. The question, therefore, arises as to why the scientific men should have been almost universally singled out in the past as subject to contracts restricting their activities subsequent to their employment.

When the technical professions are viewed in the same light as other professions, there will be fewer coercive contracts imposed upon them. The burden is placed upon chemists to demonstrate that as a class they are as upright and as trustworthy as any other profession and, once having shown this, it is only fair to require that they be viewed in this light. Technical men in high places are too prone to forget that they owe their profession their allegiance and by their own acts sometimes retard its advance. There should be no conflict between the aspirations of industry and the technical professions, as the goal is identical. The salvation of industry will result from technical advances accompanied by advances in the domain of human relations. Each is complementary to the other and, without both, partial success only is attainable.

Attitude Toward Publication

Another feature somewhat allied to patents is publications. A liberal attitude in this respect is undoubtedly warranted. First, the men appreciate the opportunity of obtaining scientific recognition and are better satisfied with their jobs. Second, the company gains a reputation for progressiveness in its field, which is of distinct value. Publication should be judicious and care should be taken to see that matter published is accurate and worthwhile. The subjects should usually, of course, not give manufacturing details, but any basic fundamental knowledge that would add to the scientific knowledge of the world should be published as a matter of course, after having taken due precautionary protecting steps. Publication is one of the most valuable forms of advertising and, if not overworked, is profitable for any company.

All the foregoing suggestions presuppose an attitude of enlightened selfishness, on the part of the company management, which is justifiable. Given this and esprit de corps, beneficial results follow logically.

Advances in Sugar Technology Include Widened Use of Invertase

The work on carbohydrates that is being carried on in the Bureau of Chemistry formed the basis of the six papers presented before the Chemical Society of Washington, March 13. Following an introductory paper on the early carbohydrate work of the bureau by the director, Dr. C. A. Browne, several papers were devoted to important industrial applications of invertase in sugar-using industries.

The manufacture of confectionery on a large scale is rapidly passing out of the class of rule-of-thumb industries, for efficient commercial operation requires very careful physical chemical control of processes and products. H. S. Paine and R. T. Balch presented work on the use of invertase in this industry for all types of candies containing fondant. By proper application of this enzyme, the shelf life of hard candy is prolonged, package goods can be made softer and sirup-containing fruit center candies can be successfully controlled. Even bonbons, which tend to dry out, become spotted and lose their gloss, can be controlled with proper amounts of invertase in the fondant. Use of this material also makes candy manufacture a continuous operation with modern mechanical material-handling equipment. The ripening process is eliminated altogether and candy remains in the starch molds only long enough to cool. The control of hydrogen-ion concentration with citric acid and other precautions for chemical control put the confectionery business on such basis that it becomes a chemically controlled process industry.

Invertase can also be used in making maltose fondant from starch by carefully controlled methods developed by H. C. Gore. With this process a crude starch with malt is liquefied without difficulty of sliming or mechanical loss during filtration. An essential precaution is maintenance of the p_H value at approximately 6 and the maintenance of proper temperature. Gore estimates that this process will lend itself to manufacture of maltose at much lower cost than has ever been attained previously and will afford this sugar for use in confectionery and other manufactured products at prices that will permit it to compete successfully with sucrose. He believes that in case of emergency all of the imported cane sugar could readily be replaced by maltose made by such process without serious technical difficulty or financial disadvantage.

The use of invertase in cane sirup manufacture, described by C. F. Walton, Jr., has already been reported in *Chem. & Met.* Some of the laboratory apparatus for sugar plant research presented by L. E. Dawson will be subsequently described in these pages. D. H. Brauns reported on his studies of optical rotation and atomic dimension.

Absorption of Sulphur by Clayware

Research work on the effects of the absorption of sulphur gases by ferric oxide in clays, when the clayware is being burned in the kiln, has been completed by the Department of the Interior at the Ceramic Experiment Station of the Bureau of Mines, Columbus, Ohio. The changes in the nature and amount of sulphur absorbed at different temperatures were accurately determined. It was found that with increase in temperature up to 450 deg. C. about half of the ferric oxide changes to ferric sulphate, a soluble salt that may cause scumming. At higher temperatures some of this ferric sulphate and most of the remaining iron combine with sulphur in an insoluble form. This work is part of a general study of the oxidizing effects of various impurities present in different clays, and coals used for fuel, on the quality of the ware. The purpose is to determine what substances are responsible for bloating, shrinkage, warping and discoloration.

Perforation Increases Penetration of Wood Preservatives

After 30 months observation of creosoted wood which has been perforated during treatment to produce deep saturation, a committee of the American Wood Preservers Association reports that the perforation treatment not only prevents harmful checking but tends to close checks that are in the timber at the time of treating. Even without use of preservative, perforation seems to reduce checking to a greater extent than preservative impregnation without perforation.

Equipment News

From Maker and User

Square Instruments for Switchboards

New and Convenient Design Which Saves Much Space on Control Boards

A complete line of rectangular-shaped instruments, including direct-current voltmeters and ammeters, for use on switchboards controlling alternating-current machines, has been developed by the Weston Electrical Instrument Co., Newark, N. J. All the instruments of the group have uniform-case size dimensions—5¾ in. wide and 6 in. high. This affords a remarkable saving in space, which has been attained without sacrificing any of the essential characteristics of the Weston round-pattern instruments. In the case of the rectangular instrument, four may be laterally accommodated on a 24-in. panel, whereas the round-pattern instruments require a 32-in. panel and a greater vertical space. The ratio of space is approximately five to nine in favor of the rectangular case. A triplex ammeter is offered which contributes to the saving in space where an ammeter is required in each phase.

Although the new instruments occupy a much smaller space, reference to the cut shows how it was possible to preserve exactly the same scale length as in the round-pattern instruments. Further, there has been obtained a much larger scale opening, permitting better illumination and improved legibility, which is also facilitated by larger and heavier scale numerals printed on a horizontal plane. The wiring studs in the rear of the instrument have been grouped in the center and have been kept uniform on all types, so that any instrument with an equal or lesser number of studs than another can replace it without requiring new drilling. Resistors, where used, are mounted back of the switchboard on studs projecting from the rear of the instrument. These resistors have also been made correspondingly smaller. The illustration shows the a.c. ammeter, typical of the line.

Square Design of Electrical Instrument

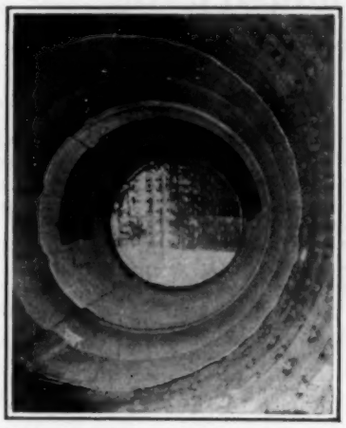


Fig. 1—Interior of Tank Car, Showing Various Layers of Rubber Lining

Fireproof Material

Johns-Manville, Inc., 296 Madison Ave., New York City, has placed on the market a corrugated building board under the name of "Transite." This material, besides being fireproof, is, as near as possible, proof to acids, alkalis, moisture, heat and cold. It is intended for use in skeleton frame construction.

The materials from which this board is made are asbestos and portland cement. It is shaped into corrugated sheets in the hydraulic press. The sheets are 42 in. wide. They are applied as is ordinary sheathing. This material is recommended by the makers for use in all construction work where corrugated metal is applied and also for those places where corrosive or similar conditions have hitherto excluded such material.

Rubber-Lined Acid Tanks

Coupled with the recent great increase of acid shipments and acid storage has come a demand for more serviceable acid containers. Makers of this type of equipment have recognized this demand and already several containers have appeared on the market for which much is claimed.

Of these, the latest to come to the attention of the field is the series of rubber-lined tanks developed and patented by the Miller Rubber Co., Akron, Ohio. These containers are put forward as tank cars and as stationary storage tanks for use with dilute acids such as sulphuric, hydrochloric, tannic and phosphoric.

In making the tank, an acid-resisting rubber compound is vulcanized to the inside walls of the tank. Anchoring devices are secured to the inner surface of the tanks, spaced about 1 ft. apart. The first coating consists of a rubber-covered wire screen, which is applied to the surface of the tank. The anchors pierce this screen and clinch on the opposite side, thus rigidly holding this base coating tightly to the walls of the tank. After this, several layers of the special compounded rubber are applied on this base and vulcanized, thus completely covering the tank walls with an acid proof lining.

Universal Electric Welder

Electric arc cutting and welding equipment has been made in the past so that it could be used with two different voltages, as 110-220 or 220-440. In an endeavor to supply the need for a more adaptable device, one that will operate on any ordinary industrial current, the Electric Arc Cutting & Welding Co., Newark, N. J., has placed on the market a new design, called the "Universal Welding Machine."

This machine is so designed that practically any power supply can be made with one unit of the apparatus. A 110-220-440 volt combination is obtained by multiple, series multiple and series combinations of the coils of the primary winding. To make the machine operate on 25 and 40 cycles, taps and adaptor windings are used to obtain the proper electrical characteristics. The difficulties overcome in this development may be judged when it is considered that the blower and automatic switch must operate also on these various voltages. The apparatus is also made operative on 110 and 220 volts, direct current, by means of a resistor-reactor combination inserted in the secondary winding.

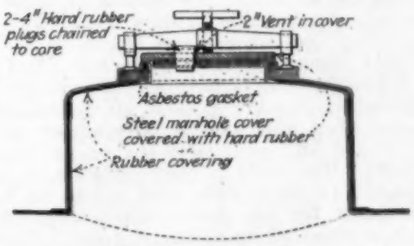


Fig. 2—Method of Covering Tank Car Manhole With Rubber

Manufacturers' Latest Publications

The Calorizing Co., Pittsburgh, Pa.—"The Calco Handbook of Recuperation," a book by G. D. Mantle, engineer the Calorizing Co., presenting the principles of combustion and recuperation, the theory of recuperator design, types of recuperating equipment available and many valuable engineering data in the form of easily used tables and curves.

Review of Recent Patents

Trend of Development in the Refractory Industry

Process for Making Silica Brick by Machinery, Production of Angular Magnesite Granules and Use of Silicon in Bonding Graphite-Silicon Carbide Crucibles Feature Recent Patent Disclosures

UNTIL very recently silica refractories were entirely hand molded. Due to the almost complete absence of plasticity in the raw materials, attempts to develop machinery have been beset with unusual difficulties. An excellent outline of the problems, together with one practical solution, is given by Charles Ladd Norton, of Boston, Mass., in Patent 1,484,735, granted Feb. 26, 1924, and assigned to the Refractories Machinery Manufacturing Co., Pittsburgh, Pa.

The use of ordinary clay-working machinery is precluded by the nature of the materials. Formation of a coherent bar from the sharp angular ganister grains and the cutting of this bar into individual pieces is obviously out of the question, although this is common practice with more plastic materials. Accordingly, it has been necessary to study the operations of the hand molder and to devise a machine that would imitate them as closely as possible.

In hand molding, the workman fills the mold by forcibly hurling into it masses of the ground ganister. As this has about the consistency of moist sand, considerable skill is required in getting the corners and angles of the mold completely and uniformly filled. When the mold is heaping full, the material is further packed by pounding and then the excess is removed or "slicked off" even with the top of the mold. The mold is then inverted on a pallet (a steel plate that serves as a support for the green ware) and the mold removed by taking it apart. The pallet with the refractory shape is then placed upon drying racks, the molded shape being too friable to be handled except on a pallet.

The operation of inverting the mold was necessary for two reasons: If molded directly on the pallets, the shapes would adhere so tightly that it would be impossible to remove them from the pallet without injury after drying; it is usually desired to stamp a brand mark on the molded shape, and it would be impracticable to provide each pallet with the marking device that is now incorporated in the bottom plate of the mold. Accordingly, in his earlier patents, 1,332,676 and 1,332,677, Mr. Norton adhered to the idea of inverting the mold onto a pallet. Process and apparatus were complicated to a certain degree because of this feature, and he has now found it possible to eliminate it in the following way:

A pallet is firmly supported on a heavy rectangular block or anvil. The upper surface of the pallet is coated with crude petroleum or similar oily material that will prevent sticking. An open-topped mold box is then placed in position on the pallet and filled to overflowing by allowing a charge of the raw material to drop into it from a hopper some distance above the mold in the same vertical line. A rotating slicker disk then passes over the top of the mold box, removing surplus material. A push plate bearing the brand is forced down upon the material in the mold, compressing it to the desired degree. With the shape still held in position by the push plate, the mold box is lifted vertically. As soon as the mold box has been loosened from the shape, both push plate and mold box move upward, leaving the molded shape supported on the pallet, ready to be placed on the drying rack.

This process permits the production of properly molded and marked shapes at a substantially higher rate of speed than is possible where inversion of the molded shape is a necessary step.

Basic Refractory Material

Magnesite or dolomite in the form of angular grains for use in lining basic open-hearth furnaces is the subject of Patents 1,483,468 and 1,483,469, granted to Albert P. Meyer, of Pittsburgh, Pa., Feb. 12, 1924, and assigned to the Allen S. Davison Co., of Pittsburgh.

In preparing American magnesite as a substitute for the Austrian variety, it has been customary to add fluxes such as iron oxide to the finely powdered magnesite and burn the mixture in inclined rotary kilns. The product is rounded open-textured aggregates of imperfectly united particles. It has but little mechanical strength and the roundness is undesirable in the linings and in patching, since the grains tend to roll out of place.

Mr. Meyer mixes the finely ground magnesite with suitable fluxes so that the Fe_2O_3:SiO_2:Al_2O_3 ratio is about 7:7:2 and the amount of flux corresponds to 8 to 17 per cent in the burnt product. This mixture is stirred up in water and formed into cakes in a filter press, using about 150 lb. pressure. The cakes are dried until hard and rigid and are then broken up in a jaw press to give an angular granular product. This is screened to give $\frac{7}{16}$-in. granules, which are burned at 2,800 to 3,000 deg. F. in a rotary kiln 160 ft. long by 6 ft. internal diameter, fired by powdered coal. The angular shape persists through firing; the product is very uniform and excellently adapted for open-hearth linings. Dolomite yields a similar product.

Graphite-Silicon Carbide Crucibles

An interesting process for manufacturing crucibles composed of graphite and silicon carbide is disclosed by Clarence J. Brockbank, of Philadelphia, in Patent 1,483,507, Feb. 12, 1924, assigned to the Ross-Tacony Crucible Co.

Unless protected by a refractory glaze, crucibles of this type rapidly

American Patents Issued March 11, 1924

The following numbers have been selected from the latest available issue of the *Official Gazette* of the United States Patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.'s* staff, and those which, in our judgment, are most worthy will be published in abstract. It is recognized that we cannot always anticipate our readers' interests, and accordingly this advance list is published for the benefit of those who may not care to await our judgment and synopsis.

1,486,137—Process of Recovering Cyanide. Arthur L. Halvorsen, Perth Amboy, N. J., assignor to the Merrill Co., San Francisco, Calif.

1,486,141—Process of Treating Peat. Henry H. Hindshaw, St. Paul, Minn., assignor to Hindshaw Engineering & Development Co., St. Paul.

1,486,214—Composite Refractory Metallic Body. George Fred Yessler, Port Chester, N. Y.

1,486,387—Evaporator. Clark D. Lebermuth, Donaldsville, La.

1,486,592—Method for Producing Hydrocyanic Acid. Otto Liebknecht, Frankfort-on-the-Main, Germany, assignor to the Roessler & Hasslacher Chemical Co., New York, N. Y.

1,486,618—Manufacture of Calcium-Carbide Cakes. Hermann Them, Dinglingen, Baden, Germany, assignor to Carbide, Ltd., London, England.

1,486,646—Alcohol, etc., and Process of Making Same. Carleton Ellis, Montclair, N. J., and Mortimer J. Cohen, New York, N. Y., assignors, by mesne assignments, to Seth B. Hunt, trustee, Mount Kisco, N. Y.

1,486,647—Production of Acid Extract and Alcohols From Hydrocarbon Gases. Carleton Ellis, Montclair, N. J., and Mortimer J. Cohen, New York, N. Y.; George Cohen, Adolph Breslauer and Herman Asher, executors of said Mortimer J. Cohen, deceased; said Ellis and the executors of said Cohen, deceased, assignors, by mesne assignments to Seth B. Hunt, trustee, Mount Kisco, N. Y.

1,486,743—Drying Kiln. Edwin A. Hallam, Portland, Ore., assignor to (Mrs.) Mary B. Hallam, Portland, Ore.

1,486,757—Method of Automatic Regulation of the Supply of Oxidizing Agents, Such as Nitric Acid, Nitrate Solution, or Others in the Manufacture of Sulphuric Acid. Ernst Jensen, The Hague, Netherlands.

1,486,775—Soap-Mixing Device. William R. McGrath, Atlanta, Ga.

1,486,781—Catalytic Material for the Oxidation of Aromatic Compounds by Means of Oxygen-Containing Gases; Joseph V. Meigs, Montclair, N. J., assignor, by mesne assignments, to Carleton Ellis, Montclair, N. J.

1,486,782—Combined Pressure Regulating and Governing Apparatus. Jules P. Metzger, Carlstadt, N. J., assignor to the Leslie Co., Lyndhurst, N. J.

1,486,794—Apparatus for the Treatment of Coal or Similar Carbonaceous Substances. Ernest Owen, New York, N. Y.

1,486,799—Process of Generating Gas. James Henry Reid, Readsboro, Vt., assignor to International Nitrogen Co., Cleveland, Ohio.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

soften or rot, due to oxidation of the graphite. As glazes applied by painting, dipping or spraying do not adhere, Mr. Brockbank proposes to form the glaze in a unique manner. Powdered graphite, 50 parts by weight, silicon carbide, 50 parts, and silicon, 10 parts, are mixed with sulphite cellulose, tar or other temporary binder and formed into crucibles.

After seasoning until dry and hard, the molded article is placed in a sagger and heated to a temperature of 1,300 to 1,600 deg. F. for 8 hours. During this heating the silicon, which has a high vapor pressure at this temperature, partly diffuses and penetrates the pores of the entire mass. It is also probable that there is some reaction between the graphite and the silicon vapor whereby the same is partly silicidized and converted to silicon carbide. The greater proportion of the silicon, however, remains in the body in the elementary condition. After this baking operation the articles are dull black in color and coherent in structure, but they have not the hardness and resonance necessary in a refractory article of this character. This is produced by the following operation, which develops both the permanent body bond and surface glaze. The articles are immersed until the pores are saturated, which usually takes about 1 hour, in a 10 to 20 per cent solution of caustic soda. A vigorous effervescence takes place due to the liberation of hydrogen by the reaction of the alkali with the silicon in the body. The article is then dried and baked in an oven at a cherry red heat for approximately 1 hour. During this operation the sodium silicate formed in the body by the chemical union of the silicon and the alkali exudes to the surface, leaving a small proportion only in the body and producing a dense, hard refractory article, coated with a continuous glaze, which affords complete protection against surface oxidation.

Combustion in Cement Kilns

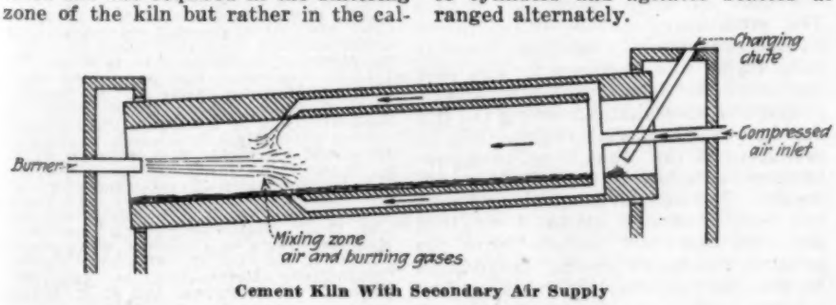
Secondary Air Supply Gives the Maximum Temperature in the Calcining Zone

A method of getting the maximum temperature in a cement kiln where it is most desired is described by Otto Dormann, of Stettin, Germany, in Patent 1,484,254, issued Feb. 19, 1924.

Recent investigations have established the fact that the sintering reaction in cement manufacture is exothermic, so that maximum temperatures are not required in the sintering zone of the kiln but rather in the calcining zone just preceding, where the reaction is endothermic.

Mr. Dormann proposes to obtain the desired result by introducing secondary air into the calcining zone at high pressure and at an angle in a direction opposed to the flame. This causes the formation of eddies, which give an intimate mixture of fuel and air. At the same time the gases are dammed up in such a way that they will not pass across the material at a higher speed than is consistent with reasonable heat transfer to the cement.

The secondary air may pass longitudinally through the kiln walls before reaching the discharge orifice and thus become preheated. Additional fuel may also be mixed with the charge. This will be burned by the secondary air.

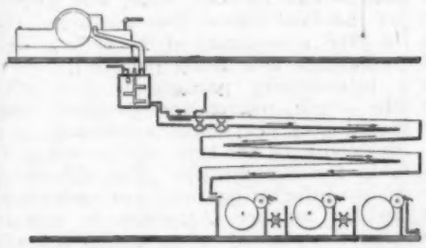


Cement Kiln With Secondary Air Supply

Continuous De-inking Process

Beater, Consistency Regulator, Reacting Troughs and Washers Arranged for Uninterrupted Production

John Stevens, 3d, of Boston, has developed a continuous process for de-inking paper. (Patent 1,482,825; Feb. 5, 1924; assigned to Arthur D. Little, Inc.) The arrangement of apparatus will be clear from the accompanying illustration.



Continuous De-inking Process

The waste print paper is first beaten to a pulp with hot water (120 to 180 deg. F.). The pulp flows by gravity to a mixing vat provided with a thermostat and steam connections for automatically regulating the temperature of the pulp. This is followed by a consistency regulator. Uniform temperature and consistency having thus been obtained, soda ash solution is added and thoroughly mixed in by means of agitators. The treated pulp then flows down the inclined troughs to the washers. The zigzag course of the troughs insures sufficient time of contact between alkaline solution and pulp to loosen the ink, sizing, etc. As is usual in this class of apparatus, the washers consist of cylinders and agitator beaters arranged alternately.

Book Reviews

Personnel Management

PERSONNEL MANAGEMENT: PRINCIPLES, PRACTICES AND POINTS OF VIEW. By *W. D. Scott* and *R. C. Clothier*. 488 pages. A. W. Shaw Co., Chicago. Price, $4.

Reviewing a book of nearly 500 pages by two such well-known authorities as Scott and Clothier is a momentous task, and in the hope of obtaining light on the best methods of approach, I first read a review that had already appeared elsewhere, only to find that the reviewer had devoted nearly all of the two columns allotted to him to generalizations on the subject of personnel management; about the only remarks that dealt specifically with the book were as follows: "In its mechanics and arrangement the book is excellent. It is abundantly illustrated with charts and specimen records. A complete bibliography of the specific subject matter follows every chapter. The latter feature should be especially helpful to anyone interested in a deeper study of the subject."

This is all quite true, but it does not go very far toward answering the question that is presumably in the mind of the reader of a book review, "Is it worth while for me to read this book?" But how can the reviewer answer this question unless he knows who you are, reader who by tradition are always gentle and presumably intelligent? The most effective approximation would, perhaps, be to indicate what kind of people the book was apparently intended for. In this case the reviewer admits he does not know, and would hazard the guess that the authors either designed to offer to the general public a rounded treatise covering the whole field well enough so they would not need to buy any but the one book, or else intended it as the text book for a college course. If any one interested in personnel management intends to buy only one book, I should recommend this one, for a variety of reasons. But in a field where progress is so rapid and there are so many advanced workers, like skirmishing parties in advance of the army, it is hardly safe to buy only one book, unless your interest is limited. One book on geometry will do, but in a field where opinion and interpretation is still a large, perhaps the larger, part, avoidance of the spell of dogma can be obtained only by wide reading.

I feel I ought to praise so good a book as this unreservedly, and yet I cannot quite bring myself to it. All of us have our pet aversion, and mine is the too profuse use of capital letters. Qualification Cards, Intelligence Tests, Capacities, Final Ratings, Personnel Control Charts, Tests for Specific Ability, and such-like sprinkled on every page affect me like too little salt in my morning oatmeal, and much the same effect is produced by such elephantine, playful expressions as "the negro in the kindlings." Nor can I quite convince myself that any book ought to extend to 488 pages unless it

is a text book which students can be required to read, or is intended only for reference purposes. Only one actual error was noted; on page 44 the authors indicate they are unaware that carbon dioxide is not only harmless in ventilation but actually induces deeper breathing and increased lung ventilation. Lest the reader think the general tone of my comments unfavorable, let me repeat that if I could have only one book on personnel management, I would choose this one. T. T. READ.

Hydrogen-Ion Concentration

THE DETERMINATION OF HYDROGEN IONS. By *W. Mansfield Clark*, M.A., Ph.D. Second Edition, reprinted. 480 pages, illustrated. Williams & Wilkins Co., Baltimore. Price, $5.

In the preface to the second edition, Dr. Clark pleads "a disquieting realization of the responsibility assumed at the first venture," and makes some apology for what he considers "deficiencies in the bibliography and its classification." It would seem, however, that an addition of 900 titles to the original 1,100 after only 2 years is a promising indication of what has gone into the new edition.

The chapter sequence remains the same as in the former edition, except for the formation of two new chapters, on acid-base equilibria and calomel electrodes. The range of subjects has not been greately widened, although the treatment in most cases is more detailed.

After two chapters devoted to a review of acid-base equilibria, the author presents the colorimetric method of determining p_H, together with the theory of indicators. The chapter devoted to the latter topic has been amplified considerably. A chart showing the colors of Clark and Lubs' indicators in solution of known p_H, a discussion of standard buffer solutions and an outline of errors of the method contribute much to the value of this part of the work.

The electrometric method is offered first in outline. It includes an elementary consideration of the theory of the method, and a diagram of a simple set of apparatus, suitable for p_H determinations. The possibilities of a simple system, like Hildebrand's, are indicated. "It not infrequently happens that the outlining of a problem with this or a comparable system will indicate that further refinement would be useless or confusing." This suggestion merits an even greater emphasis.

There follows a detailed account of the electrometric method, in which much space is devoted to a discussion of the apparatus required, the theory of the reactions involved, and the laboratory procedure. This forms the most valuable part of the book to those who contemplate precise p_H measurements. The text, in conjunction with the bibliography, affords the best single source of information available.

Brief mention is also made of methods of minor importance suitable for p_H determination. These include the quinhydrone electrode, conductivity, and catalytic decompositions of various types. This is the last expository chapter, as the final one constitutes an index to the bibliograply and enumerates applications of the methods presented in the text. These applications cover a wide range of subjects, including adsorption, bread, filtration, hydrolysis, leather and tanning, milk, soil acidity, and many others—all of which indicates the wide appeal of this volume and makes its second edition welcome and valuable.

HOWARD ADLER.

Books Received

Peat as a Source of Fuel and Chemical Byproducts

FACTS ABOUT PEAT. By *B. F. Haanel*. Mines Branch Report 614, Department of Mines, Ottawa, Canada.

Surveys of peat bogs in several provinces in the Dominion of Canada indicate a known reserve of about 200,000,000 tons. In view of the importance of the subject and because of the ill effects of misinformation and faulty technical advice, culminating in commercial fiascoes, what was known as the Peat Committee was appointed in 1918, a summary of its findings and researches now being published.

Introductory paragraphs deal with the origin, nature and chemical composition of peat; this is followed by a discussion of the type of deposits suitable for exploitation. The difficulties in manufacturing peat are recognized by the author. Attempts to remove excess water by pressure on a commercial scale have proved abortive, and although in recent years the wet-carbonization process, by which the peat is preheated by high-pressure steam to alter the character of the hydrocellulose, appeared promising, no commercial production by this system has been reported.

Artificial drying involves abnormal expense. Atmospheric drying is economically possible; in Ireland, 7,000,000 tons of peat is manufactured thus annually. Unsuccessful peat manufacture started in Canada apparently in 1864. The first failure was followed by the flotation of a large number of concerns, involving the expenditure of several million dollars, without tangible result. The government, however, kept the problem in mind and imported from Europe a plant and a technician, who demonstrated the practicability of commercial manufacture and economic success.

Details of manufacture are given. The preliminary phases of operation include excavation by machine, maceration, drying and harvesting. The utilization of the dried product for power production necessitates burning (1) under boilers of special design; (2) in producers of the Mond type, to manufacture byproducts; (3) or in gas producers. The cost of production of peat has been estimated at $3.50 per ton; and fuel users are satisfied with the product, the report shows. In addition to the part solution of meeting fuel requirements, the known and estimated reserves of peat in Canada contain about 2,600,000 tons of free nitrogen, which it is estimated could be manufactured to produce 8,500,000 tons of ammonium sulphate. Peat fiber is also available for the manufacture of textiles and cardboard.

The bulletin concludes with a lengthy bibliography of the subject, of interest and value to all who are concerned with the utilization of peat resources and the manufacture of salable products and byproducts.

Low-Grade Fuels

UTILIZATION OF LOW-GRADE AND WASTE FUELS. By *W. Francis Goodrich*. 368 pages, 212 illustrations. Ernest Benn, Ltd., London. Price, 42s.

Many fuels formerly regarded as worthless are being used at present and there is every reason to believe that this development will continue. Accordingly, consideration of such materials as colliery waste, lignite, peat, coke breeze and wood waste is of immediate interest. Briquetting, gasification of low-grade coal and methods for firing the fuels under discussion are treated thoroughly.

New Publications

"KEENE THRUSTS" is the title of a new bimonthly publication of the Youngstown Boiler & Tank Co., of Youngstown, Ohio, the first number of which appeared in January, 1924.

"CHEMISTRY AND YOU" is the title of another new monthly publication, published by the Arthur R. Maas Chemical Laboratories of Los Angeles, Calif.

COBALT ORES. By Edward Halse. A monograph prepared under the direction of the Mineral Resources Committee of the Imperial Institute. Price 3s. 6d. net. This can be purchased from John Murray, Albemarle St., W., London, England.

THE IMPERIAL MINERAL RESOURCES BUREAU, London, England, has published several new booklets, including one on magnesite, price 1s. 9d.; diamonds, price 1s. 6d.; chrome ore and chromium, price 1s. net; monazite, price 6d. net; talc, price 9d.; titanium, price 6d.; and cadmium, price 6d. These all give statistics from 1919 to 1921, and can be obtained from His Majestiy's Stationery Office, Imperial House, Kingsway, London, W. C. 2, England.

THE UNIVERSITY OF UTAH has published Bull. 14, entitled "Research Investigations" for the year 1922-23.

NEW BUREAU OF MINES PUBLICATIONS: Bull. 221, Production and Briquetting of Carbonized Lignite, by E. J. Babcock and W. W. Odell; Tech. Paper 337, Carbon Monoxide Hazards From House Heaters Burning Natural Gas, by G. W. Jones, L. B. Berger and W. F. Holbrook; Bull. 230, Analyses of Samples of Delivered Coal, collected from July 1, 1915, to Jan. 1, 1923, with a chapter on the Tidewater Pool Classifications, by Ned H. Snyder; Tech. Paper 262, Certain Interfacial Tension Equilibria Important in Flotation, by Will H. Coghill and Carl O. Anderson; Tech. Paper 274, Efficiencies in the Use of Bituminous Coking Coal as Water-Gas Generator Fuel, by W. W. Odell.

NEW BUREAU OF STANDARDS PUBLICATIONS: Circ. 150, Recommended Specification for Quicklime and Hydrated Lime for Use in the Manufacture of Sand-Lime Brick; Circ. 153, Recommended Specification for Quicklime and Hydrated Lime for the Manufacture of Silica Brick; Tech. Paper 245, Embrittlement of Malleable Cast Iron Resulting From Heat-Treatment, by Leslie H. Marshall; Circ. 151, Wall Plaster: Its Ingredients, Preparation and Properties; Circ. 152, Recommended Specifications for Ceramic Whiting; Tech. Paper 246, Wet-Process Enamels for Cast Iron, by R. R. Danielson and H. P. Reinecker; Tech. Paper 248, Exposure Tests on Colorless Waterproofing Materials, by D. W. Kessler; Thermal-Conductivity Method for the Analysis of Gases, by P. E. Palmer and E. R. Weaver.

News of the Industry

Summary of the Week

Federal legislation to regulate oil pollution of waterways expected in near future.

Central Pennsylvania chemists plan to form local section of American Chemical Society.

Spring meeting plans of American Electrochemical Society, Philadelphia, April 24 to 26, include round-table discussion of refractories problems.

Fertilizer industry used 1,820,278 tons of sulphuric acid last year, compared with 1,589,809 tons in 1922.

Amendment to tariff act proposes placing of sulphate of ammonia on free list.

Survey of raw materials conducted by Department of Commerce gathers very complete information on chemical products.

Reports of tariff investigations and bearings on chemicals will be submitted to the President at an early date.

Many vineyards in Italy transplanting with sumac owing to its high price.

Central Pennsylvania Chemists to Form A.C.S. Section

Under the direction of Prof. G. C. Chandlee, department of chemistry, Pennsylvania State College, plans are being perfected for the organization of a Central Pennsylvania Section of the American Chemical Society. It is expected that the section will start with a membership of close to 100, made up of more than forty chemists of the college staff and industrial chemists employed at different plants in Center, Blair, Mifflin, Huntingdon, Union, Snyder, Clinton, Lycoming and Clearfield counties. The opening meeting will likely be held before the close of the month, when officers will be elected for the coming year. With prospective headquarters at State College, Pa., different monthly meetings are planned at Altoona, Huntingdon, Tyrone, Williamsport, Lock Haven and other cities in the district. Assisting Professor Chandlee in the organization work are Dr. E. B. Forbes, director of the college Institute of Animal Nutrition; Prof. R. A. Dutcher, agricultural chemistry department of the institution, and Dr. D. F. McFarland, of the mining school of the State College.

Larger Use of Sulphuric Acid in Fertilizer Trade Last Year

The Department of Commerce has announced that, according to the census returns, the manufacturers of fertilizers producing sulphuric acid and acid phosphates used 886,454 net tons of sulphuric acid in the manufacture of fertilizers during the 6-months period July 1 to Dec. 31, 1923, as compared with 933,824 tons for the first half of 1923, making for the year 1923 a total consumption of 1,820,278 tons, as compared with 1,589,809 tons in 1922, an increase of 14.5 per cent. Stocks on hand Dec. 31, 1923, were 114,109 tons, as compared with 109,803 tons on June 30, 1923.

The establishments reported the manufacture of 1,609,181 net tons of acid phosphates containing 26,755,403 units (20 lb.) of available phosphoric acid during the last half of 1923, as compared with 1,758,039 net tons containing 29,140,453 units during the first half of the year, making for the year a total of 3,367,220 tons and 55,895,856 units, as compared with 2,788,207 tons and 46,612,850 units in 1922, an increase of 20 per cent.

During the half year July-December, 1923, there was sold as acid phosphates 557,332 tons and there was used in manufactured goods 249,622 tons, a total of 806,945 tons, as compared with a total of 2,230,439 tons for the first half of the year. The sales for the year 1923 aggregated 3,037,393 tons, as compared with 3,062,633 tons in 1922 (second half, 977,957 tons, first half 2,084,676 tons) a decrease of eight-tenths of 1 per cent.

The data are compiled from reports of 155 fertilizer establishments (not including dry mixing plants) located 100 in the Southern district and 55 in the Northern and Western districts, of which 84 manufactured sulphuric acid.

Of these establishments 57 were located in the Southern district and 27 in the Northern and Western districts.

Reports of Tariff Hearings Soon Ready for President

The Tariff Commission has taken up the records of investigations and hearings of several of the chemicals that have been made the subjects of inquiries under the flexible tariff, with a view to getting the reports to the President for his action at an early date. Several investigations have been held up by the commission in order that the first proclamation under the flexible tariff might be in a major case. This case was provided in the wheat investigation, and it is now proposed to dispatch to the Executive as speedily as possible all cases in which inquiries have been concluded.

Proposal to Place Ammonium Sulphate on Free List

An amendment to the tariff act, whereby ammonium sulphate would be placed on the free list, has been proposed by Senator George of Georgia.

While there is no intimation that the Finance Committee will consider this bill, it is believed that this item has lost some of the support it had at the time of its embodiment in the tariff bill. Ammonium sulphate carries a duty of one-fourth of one cent per pound. During the consideration of the tariff act, a strong effort was made to have ammonium sulphate placed on the free list after the House had voted a duty of three-fifths of a cent per pound.

Ammonium sulphate had been on the free list under the Payne-Aldrich and the Underwood tariff acts. It was argued by representatives of the farmers that imports of the commodity while it was on the free list were negligible and that large quantities of the commodity were exported.

It is Senator George's contention that the duty was levied principally upon claims that Germany was in a position to flood the American market with cheap German sulphate. Since these claims have not materialized and since the exports of this commodity continue to be large and imports small, he suggests that the act should be amended as he indicates. He points out that imports in January were only 338 tons, whereas exports in that month were 13,497 tons.

Further Hearing Granted on Cresylic Acid Duty

The Treasury Department has agreed to grant importers a further hearing in connection with the recent ruling that cresylic acid mixed with pitch is entitled to entry free of duty. Domestic producers have protested this ruling and have asked a reversal, which has been rather indicated by the department's attitude. No action will be taken until another hearing is held.

Refractories Discussion to Feature Meeting of American Electrochemists

Philadelphia Gathering April 24 to 26 Also to Cover Electrochemical Developments in Organic and Metallurgical Industries

THE spring meeting of the American Electrochemical Society is to be held in Philadelphia, April 24 to 26. The headquarters will be the Bellevue-Stratford Hotel. The technical meeting will be devoted to a symposium on "Organic Electrochemistry," Dr. C. J. Thatcher, chemical engineer and electrochemist, acting as chairman. The discussion will cover the applications of electrochemistry in the preparation of organic chemicals both in this country and abroad, and in particular, the future possibilities for the commercial production of such compounds.

The other symposium covers "Recent Progress in Electrodeposition." S. Skowronski, research chemist of the Raritan Copper Co., is chairman. A series of very interesting papers have been planned for, covering "Electrorefining of Metals," "Electroreduction of Metals," "Electroforming of Metals" and "Electroplating of Metals."

Electrodeposition Symposium

A large number of papers have been promised for the Electrodeposition Symposium. There have been very many important changes taking place within the last 10 years in electrolytic refining of metals and electrolytic winning of metals from leaching solutions and it is hoped by the committee that many of the innovations will be brought up for discussion at the Philadelphia meeting.

The "Round Table" discussion on "Refractories for Electric Furnaces" is intended to be one of the most important and interesting features of the meeting. The introductory talk will be made by Dr. Alfred Stansfield of McGill University, Montreal. Dr. Stansfield is very well known and is considered eminently qualified to discuss this subject. The discussion proper will be from the viewpoint of the furnace operator, the furnace builder and the refractory manufacturers.

The alloy and miscellaneous furnaces will also be reviewed, followed by the much discussed subject of brass furnaces.

Discussion on Refractories

M. L. Hartman of the Carborundum Co., Niagara Falls, N. Y., is chairman of the "Round Table" discussion on refractories. He has already been in touch with a large number of well-known men in the electric furnace field and many plan to attend and enter into the discussion. The steel and non-ferrous furnaces will be fully discussed.

It is generally recognized that the subject of refractories is of the greatest importance. The fall meeting of the society and the meeting of the American Ceramic Society at Atlantic City emphasized the far-reaching importance of this broad subject. A cordial invitation is extended to all members and non-members to attend the meetings and actively join in the discussions. Further particulars may be obtained by writing Dr. Colin G. Fink, secretary, American Electrochemical Society, Columbia University, New York City.

To those interested in excursion trips to industrial plants and places of interest Philadelphia offers a large number of attractions. Trips have already been arranged to visit the Philadelphia Mint, Disston Co., Dodge Steel Casting Co., Ajax Wyatt Co., Westinghouse Electric & Manufacturing Co. and an airplane factory. Arrangements have also been made which will afford an opportunity to society members to visit Edgewood Arsenal, on Saturday, April 26. The arsenal consists of eight main divisions; administrative, chemical, mechanical, medical, research, troops, plants and production, property and chemical warfare school. Its operation on a peace-time basis, as well as the facilities that are available for war emergencies, is expected to be of interest to members generally.

Dr. Arthur E. Gibbs, of the Pennsylvania Salt Manufacturing Co., is chairman of the local entertainment committee. He has announced that one of the several entertainment features will be a boat ride and shad dinner.

Larger Sumac Crop in Italy

A report from Consul Edward I. Nathan of Palermo says that the present high price of sumac and the decreased demand for wine caused a large number of vineyards in Italy to transplant with sumac last fall, and for that reason the sumac crop of 1925 is expected to be above normal.

Calendar

AMERICAN CHEMICAL SOCIETY, annual meeting. Washington, April 21 to 25.

AMERICAN ELECTROCHEMICAL SOCIETY, Hotel Bellevue-Stratford, Philadelphia, April 24 to 26.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, Denver, Colo., July 15 to 18.

AMERICAN LEATHER CHEMISTS ASSOCIATION, Spring Lake, N. J., June 18 to 20.

AMERICAN PAPER AND PULP ASSOCIATION, including T.A.P.P.I., Waldorf-Astoria, New York, April 7 to 11.

AMERICAN PAPER AND PULP MILL SUPERINTENDENTS ASSOCIATION, Dayton, May 22 to 24.

AMERICAN PHYSICAL SOCIETY, Washington, April 25 to 26.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, Cleveland, Ohio, May 19 to 22.

AMERICAN SOCIETY FOR STEEL TREATING, Moline, Ill., May 22 to 23.

AMERICAN SOCIETY FOR TESTING MATERIALS, Atlantic City, June 23 to 28.

AMERICAN WELDING SOCIETY, Engineering Societies Bldg., New York, April 22 to 24.

NATIONAL ASSOCIATION OF PURCHASING AGENTS, Boston, May 19 to 24.

NATIONAL FIRE PROTECTION ASSOCIATION, annual meeting, Atlantic City, N. J., May 13 to 15.

PAPER INDUSTRIES EXPOSITION, New York, April 7 to 12.

WORLD POWER CONFERENCE, London, June 30 to July 12.

SOCIETY OF INDUSTRIAL ENGINEERS, Buffalo, April 30 to May 2.

Tenth Chemical Show in October, 1925

Special Effort Made to Interest Technical Associations in Exposition

The Tenth Chemical Industries Exposition, which is to be held during the week of Sept. 28 to Oct. 3, 1925, at the Grand Central Palace, New York, will be the greatest of any chemical exposition yet staged, according to present forecast of the management. There will be no chemical exposition this year, to the regret of many in the industry.

The decision to forego a chemical exposition this year was made by a vote of the exhibitors in the last exposition. A decisive vote concluded that an exposition should not be held again for 2 years. The majority of the chemical apparatus and machinery manufacturers wished this respite, since it was generally felt that an interval of 2 years would give them an opportunity to prepare exhibits and displays of the most interesting possible nature. Already, the main floor is fully taken. Most of the second floor and some of the third is also contracted for.

From this it is believed that an interesting exposition is in view. New features are to be introduced. The co-operation of many professional organizations is assured to make these feature sections successful and of very direct benefit to technical men as well as of broad general interest.

This exposition has established itself as one of the most important held in America as far as industry is concerned. The management states that it attracts a greater attendance of leaders from every industry and from every quarter of the world than any other exposition.

Co-operation Has Benefited All

The co-operation that has been established between the exposition and the technical organizations is an arrangement that benefits technical men from the industry and exhibitors alike. Technical men may attend the meetings of their organizations and at the same time have the opportunity to study the exhibits. This is considered a better arrangement than to have exhibitions and meetings separated. At such large gatherings as the chemical exposition can bring together, exhibitors have increased opportunities to convey their messages. It has been the object of the exposition committee and managers to make the exposition of greatest possible benefit to technical men in every phase of chemical industry.

An interesting development by the exposition is the series of meetings arranged for the various technical associations in attendance. At these meetings exhibitors are invited to present discussions of their products. Associations for which these programs are arranged do not permit the presentation of papers of a trade nature at their regular meetings, and this co-operation with the exposition frees the association of criticism through commercial relations, while giving its members the opportunity of keeping abreast of commercial developments.

Washington News

Would Protect Inventors Through Patent Legislation

Approval of the Cramton bill to prohibit persons, corporations or associations not authorized to practice before the Patent Office from misleading the public "by word, circular, letter or advertisement" in connection with business before that agency was given at hearings before the House Committee on Patents March 14 and 15 by various witnesses. A hearing for opponents of the bill will be held later, the date not having been fixed.

Among the witnesses in behalf of the measure were Representative Louis C. Cramton of Michigan, author of the measure; Thomas E. Robertson, Commissioner of the Patent Office; Thomas Ewing, vice-president of the New York Patent Law Association and former Commissioner of Patents; and J. W. Knight, who has charge of patent law cases for the Department of Justice.

In explanation of his bill, Representative Cramton said that the present law, which authorizes the Commissioner of Patents to disbar patent attorneys for misconduct after a hearing and with the right of appeal to the Supreme Court of the District of Columbia, does not reach cases where persons unauthorized to practice before the Patent Office may victimize the gullible under cover. Cases of persons never registered at the Patent Office and others of persons disbarred conducting business under other names were cited by Mr. Cramton. Under existing law, it is difficult to reach such cases, even through prosecutions through the Post Office Department for using the mails to defraud, he said. The bill would prohibit advertisements by those not authorized to conduct business before the Patent Office.

Commissioner Robertson recited numerous specific instances of fraud that had come to his attention but which cannot be reached by his office under the existing law. Individuals or organizations are operating in questionable ways in the District of Columbia, Kansas, Massachusetts, Missouri and Oklahoma, he said. There are 9,690 patent attorneys registered, he said, explaining that it is not necessary that a patent attorney be a member of the bar.

Survey of Raw Materials Makes Progress

Secretary Hoover's letter to Senator Capper has revived interest in the raw material survey which the Department of Commerce is conducting. Very complete information has been gathered as to the situation surrounding potash, camphor, quinine, iodine and other chemical products.

In the case of each of these commodities, particular advantage can be secured if all purchases could be made through a single agency. The United States is by far the best market for potash. Could all potash purchases be made by a single agency, it is pointed out, great advantages could be secured, since it then would be possible to force competitive bidding between German and Alsatian producers. In addition, smaller contracts could be let to encourage other sources of production. In connection with potash, however, the belief is still strong that deposits of our own will be discovered. Conditions throughout a wide area of the Southwest are so favorable to the occurrence of potash that those studying this commodity are practically unanimous in their belief that some way to encourage prospecting should be found.

The measure of success that has attended the production of synthetic menthol in this country is taken as an indication that the synthesizing of camphor will be perfected eventually.

In the case of quinine, the exactions of the Dutch monopoly can be escaped eventually, it is believed, by encouraging the promising South American industry.

In connection with iodine the thought is expressed that eventually it will be possible to induce the nitrate producers that it is in their interest to reduce the price of iodine to the point where it can be used in the dye industry and in metallurgical processes. If production were not held down and if a systematic effort were made to extend its use, the eventual result would be in the interest of the producers, as well as consuming industries, which would use large quantities of iodine were the price reduced.

Appropriation of $100,000 Asked for Weevil Extermination

An amendment to the Department of Agriculture appropriation bill has been submitted by Senator Harris of Georgia to appropriate $100,000 "for the extermination and prevention of the cotton boll weevil, including an investigation of processes of the manufacture of calcium arsenate and other poisons" to be used in connection therewith.

No statement in explanation of the amendment was offered by Senator Harris on the floor at the time of its introduction, but the Georgia Senator told newspaper men that in conversations with Dr. W. D. Hunter of the Department of Agriculture and others he had been led to believe that there are hopes of discovering methods of producing calcium arsenate at a cost very much less than that at present.

Research on Synthetic Shellac

Information reaching Washington is to the effect that shellac can be sold at 20 cents a pound at Indian ports and allow a fair margin of profit. This figure was sought because of its bearing on the research in progress on synthetic shellac. It was made the basis of an estimate that synthetic shellac would have to be produced so as to sell for 25 cents or less in this country in order to compete with the natural product.

Sicily Is Largest Producer of Citric Acid*

The Italian citric acid industry during recent years has developed to considerable proportions. Italy, and more especially Sicily, has always had, and continues to enjoy, practically a world monopoly in connection with the production of calcium citrate. This information has been received by the Department of Commerce from J. Allen Palmer, Trade Commissioner at Rome. He reports that the first plant that made a real success in producing citric acid in Sicily was the Fabbrica Chimica Arenella, a subsidiary of the Societá Anonima Chimica Italiana Godemberg, in turn an affiliation of the Chemische Fabrik Godemberg of Wiesbaden, Germany. The German company sent fifteen of its best workers to the plant at Palermo and gradually obtained good results. In the year 1913-14 a production of about 1,000 tons of citric acid was reached. In 1916 the Fabbrica Chimica Arenella was freed from its foreign connections and is today the largest citric acid producer in the world. The number of workers employed is about 450, and it has a capacity of from 2,500 to 3,000 tons per annum of calcium citrate—about one-third of the entire production of Sicily—from which 1,500 to 2,000 tons of citric acid is obtained. Besides this company, two others have been organized in recent years and another is at present under construction. All three are located in the Province of Messina and are able to transform 5,500 tons of calcium citrate per annum as follows:

	Tons
"I. S. A. C." Gazzi, Messina	2,000
"S. A. D. A." Tremestiere, Messina	1,000
"S. G. F. C." Teresa di Riva, Messina	2,500

If to these 5,500 tons is added the 2,500 tons output of the Arenella Co. we have 8,000 metric tons, approximating Sicily's total annual production of calcium citrate. This industry has come to the front in the course of a very few years and has had a growth which might, perhaps, even be considered too rapid.

Italy's Citric Acid Trade

The following table shows Italy's imports and exports of citric acid:

Years	Imports Quintals	Exports Quintals
1913	1,053	2,205
1920	634	18,293
1921	99	6,483
1922	29	15,783
1923 (first six months)	23	8,363

The exportation of citric acid from Italy is beginning to encounter serious difficulties. The increased duty on imports into the United States, which country in recent years has been the best customer for this product, has affected the export trade. The trade with other countries has also decreased.

Besides the Sicilian industry there is also the Societá Anonima L'Appula, which has plants in Italy proper, at Vercelli and Linate, whose combined output of citric acid for the year 1922 reached 447 metric tons. These two plants, however, are capable of producing as much as 1,200 tons per annum.

News in Brief

Superpower Maps Being Prepared—Special studies being made of the superpower situation at the instance of Secretary Hoover are revealing that the progress in interconnection of electric lines is proceeding at an amazing rate. The extent to which interconnection has been taking place has not been appreciated entirely because this is the first time data covering this situation throughout a large area have been brought together at one place. The information submitted by the states has been combined with that of the federal government and mapped. These maps, which are being prepared by the Federal Power Commission, are destined, it is believed, to be the focusing point of a large amount of attention during the next few months.

Indiana Glass Plant Resumes Operation—The American Window Glass Co., Hartford City, Ind., has resumed production at its local plant following a brief curtailment, during which a number of repairs and improvements have been made to ovens and other equipment. It is expected to maintain active operations at the works for an indefinite period, with employment of regular working force.

Canadian Sugar Refineries More Active—A quickening in the activities of the Canadian sugar-refining industry and an improvement in the domestic business over the same period of 1923 are shown by a report of the internal trade division of the Bureau of Statistics. Total domestic shipments for refined sugars for the 4 weeks ended Jan. 26, 1924, were 39,200,527 lb., as compared with 34,897,306 lb. in the corresponding period of 1923. Total export shipments to Jan. 26 amounted to 204,256 lb.

Wood Products in Tennessee—The Bon Air Chemical Co., Nashville, Tenn., organized as a subsidiary of the Bon Air Coal & Iron Corporation, capitalized at $10,000,000, divided equally in preferred and common stock, will take over the chemical interests of the parent organization, including property at Collinwood, heretofore operated by the Tennessee Charcoal Iron Co. and the Wayne Wood Products Co. The two plants have a capacity of close to 500 cords of hardwood per day, and will be developed to maximum for the production of methanol, charcoal, flotation oils and acetate of lime, as well as pitch and other tar derivatives. Extensive improvements are planned in the different departments, including retorts, to be under the direction of E. B. Rawn, chief engineer.

Congress of Chemists in France—The Fourth Congress of Industrial Chemistry under the auspices of the Société de Chimie Industrielle will be held at Bordeaux, France, June 15 to 20. It is hoped that all of the American delegates to the International Union of Pure and Applied Chemistry at Copenhagen will be able to attend the meeting. American chemists desiring to present papers at this congress should send in a request for an application blank to Dr. J. E. Zanetti, chairman, Division of Chemistry and Chemical Technology, National Research Council, Washington, D. C.

Peat Fuel to Be Made in Canada—After several years experimenting at Alfred, Ont., the Dominion Government has arranged with a Montreal company to take over and operate the peat-manufacturing plant. The plant in the past has been operated by the Dominion and Ontario governments and the Joint Peat Committee, and the results were in a measure successful. Kennedy Stinson, president of the Stinson-Reeb Builders' Supply Co. of Montreal, and E. V. Moore, consulting engineer of the Joint Peat Committee, are interested in the company, known as Peat Fuels, Ltd., which will take over the peat plant, remodel it on the design recommended by the Peat Committee and operate it on a commercial basis.

Eye Hazards Report Coming—The report of a 2-year study of the eye hazards of industrial occupations—accident hazards, disease hazards and hazards from poor lighting—and of the most effective means of eliminating such hazards is to be issued in the near future by the National Committee for the Prevention of Blindness, whose headquarters are 130 East 22nd St., New York City. The study was made by Lewis H. Carris, managing director of the committee, and Louis Resnick, a former member of the staff of the National Safety Council.

Southern Companies Propose Arsenate Plant—Manufacture of calcium arsenate on a large scale is proposed by the associated Southern power companies that jointly have offered to lease Muscle Shoals. B. C. Edgar, vice-president and general manager of the Tennessee Electric Power Co., in an interview at Chattanooga, says plans are under consideration for manufacture of calcium arsenate by the Kennedy-Lloyd electrolytic method. A plant of 20 tons capacity now is being erected at Montgomery, Ala., to use this process.

Manning and Fischer Leave Petroleum Institute—Dr. Van H. Manning, director of research for the American Petroleum Institute since June 1, 1920, and formerly director of the United States Bureau of Mines, has resigned to take charge of research for the Pan-American Petroleum & Transport Co. During Dr. Manning's long connection with the industry he has been instrumental in bringing about many technical advances in the production, refining and marketing of petroleum products. Harmon F. Fischer, who was associated with Dr. Manning at the Institute, has accepted a position with the Knox Process Co. and will have charge of production and operation at this company's plant at Texas City, Tex.

Heat Transfer Symposium Plans Are Announced

The heat transfer symposium planned by the Section of Industrial and Engineering Chemistry to be held in connection with the spring meeting of the American Chemical Society at Washington, D. C., April 21 to 25, includes the following papers:

Heat Transmission in an Inclined Rapid Circulation Type Vacuum Evaporator, By D. J. VanMarle, Buffalo Foundry & Machine Co., Buffalo, N. Y.

Evaporator Scale Formation, by W. L. McCabe and C. S. Robinson, department of chemical engineering, Massachusetts Institute of Technology, Cambridge, Mass.

Heat Transfer in Enamel-lined Equipment, by E. P. Poste, Elyria Enameled Products Co., Elyria, Ohio.

Forced Convection of Heat in Gases and Liquids, II, by C. W. Rice, research laboratory, General Electric Co., Schenectady, N. Y.

The Film Concept of Heat Transmission Applied to a Commercial Water Heater, by D. K. Dean, Alberger Pump & Condenser Co., Boston, Mass.

Characteristics of Air Blast Heaters, by F. R. Ellis and J. D. White, B. F. Sturtevant Co., Hyde Park, Mass.

Heat Transfer From Bare and Insulated Pipes, by R. H. Heilman, Mellon Institute of Industrial Research, Pittsburgh, Pa.

Loss of Heat From Furnace Walls, by R. Calvert and Lyle Caldwell, the Celite Co., Lompoc, Calif.

Optimum Operating Conditions for Pipe Heating and Cooling Equipment, by W. K. Lewis, J. T. Ward and E. Voss, chemical engineering department, Massachusetts Institute of Technology.

A Heat Meter, by Percy Nichols, research laboratory, A.S.H.V.E., U. S. Bureau of Mines, Experiment Station, Pittsburgh, Pa.

Heat Losses From Various Shapes, L. B. McMillan, Johns-Manville Co., New York City.

Evaporator Design, by W. L. Badger, department of chemical engineering, University of Michigan.

In addition to the above, papers are to be presented by Harold C. Weber, R. F. Kohr and L. Butler, Mayo D. Hersey and G. B. Wilkes.

Weeks Offers Assistance in Explosion Investigation

Governor Silzer of New Jersey has been urged by residents in the district of the Ammonite plant and the Raritan arsenal to take every step necessary for preventing a recurrence of the disaster, reported in *Chem. & Met.*, March 10. His communication to the War Department brought a personal reply from the Secretary, giving assurance that persons in Middlesex County need have no apprehension, nor is there any necessity for removing the arsenal.

In response to Governor Silzer's request Secretary Weeks has offered the service of all available experts in the ordnance department for determining the cause of the accident. He has promised further that if Congress will provide the necessary funds, the explosives now stored at the Raritan arsenal will be transported to another part of the country.

Trade Notes

H. H. Dow, president of Dow Chemical Co., Midland, Mich., visited the New York offices of the company last week. Mr. Dow also attended the St. Patrick's party of the Chemical Salesmen's Association on March 17.

Frank L. McCartney, general sales manager of the Monsanto Chemical Works, St. Louis, has resigned from that company and has joined the Norwich Pharmacal Co. of Norwich, N. Y., in the capacity of sales director. Mr. McCartney will make his headquarters at the Chicago office of the company.

Thomas J. Deegan, who for more than 36 years was connected with the American Cotton Oil Co. and until recently was manager of its general export division, has started business under his own name with offices at 29 Broadway, New York.

The operation of increased duty on imports of citric acid into Australia, which had previously been deferred to March 31, has been further postponed until Sept. 30.

Total exports of phosphates from Morocco, zone of the French protectorate, during 1923 amounted to 191,060 metric tons. Spain and the Netherlands were the largest buyers of these phosphates.

Garvan Dinner Coming April 26

A dinner in honor of Francis P. Garvan is to be held April 26, at the Waldorf-Astoria, New York City. Invitations are being sent out by the presidents of most of the societies interested in chemistry, including the American Chemical Society, Dr. Leo H. Baekeland, president; American Electrochemical Society, Arthur T. Hinckley, president; American Institute of Chemical Engineers, Dr. Charles L. Reese, president; American Association of Textile Chemists and Colorists, Dr. Louis A. Olney, president; Manufacturing Chemists Association, Elon H. Hooker, president; Salesmen's Association of the Chemical Industry, Ralph E. Dorland, president, and Synthetic Organic Chemical Manufacturers Association, Dr. Charles H. Herty, president.

At a recent meeting of the representatives of these organizations, Dr. Charles H. Herty was appointed chairman of the committee on arrangements, and A. V. H. Mory, of the American Chemical Society, will act as treasurer.

This dinner will be the closing feature of a week of unusual chemical activities. Both the A.C.S. and the A.E.S. have been invited by General Amos A. Fries, head of the Chemical Warfare Service, to visit Edgewood Arsenal on Saturday, April 26, to inspect the grounds and buildings, and to witness in the afternoon an outdoor demonstration by this important division of the United States Army. The Pennsylvania Railroad has arranged a special train to take the visitors at Edgewood Arsenal direct to New York in time for the dinner.

Chemical Salesmen's Association Holds St. Patrick's Party

The Salesmen's Association of the American Chemical Industry held a St. Patrick's party on the evening of March 17 at the Aldine Club, New York City. After dinner had been served, Ralph E. Dorland, president of the association, called the meeting to order and introduced the speakers of the evening. The principal speakers were K. C. Li, president of the Wah Chang Trading Corporation, and Charles Lyon Chandler, of the Corn Exchange Bank of Philadelphia. Dr. Charles H. Herty also spoke briefly of the plans that had been made for giving a testimonial dinner to Francis P. Garvan in recognition of his work in behalf of the American chemical industry.

At a meeting of the executive committee of the association Elias A. Johnson of the Monsanto Chemical Works, Charles H. Berle, Leonard L. Lehritter and Walter J. Murphy of the American Cyanamid Co., were elected to membership.

Cotton Crop 10,128,478 Bales

Production of cotton in the United States in 1923, according to the final ginning report of the Bureau of the Census, issued March 20, was 10,128,478 bales. This compares with 9,762,069 bales in 1922. A crop of 10,081,000 bales was estimated last December by the Department of Agriculture.

Company Reports

C. W. Miller, president of the Davison Chemical Co., in a report to stockholders stated that the sale of Silica Gel stock to stockholders of Davison Chemical has been brought to successful conclusion. Davison has received $1,998,750 and has also received from the Silica Gel Corporation $658,105 in payment of amounts due. He further said that the Silica Gel refining plant which had just been completed for and at the cost of the Royal Dutch Co. at New Orleans has been tested to full operation and has not only met but exceeded every claim made for it both as to quality of product and cost of production. It has been running on Mexican cracked kerosene, one of the most difficult tests to which it can be put.

Earnings of the Phillips Petroleum Co. for the quarter ended March 31 will exceed those for any previous quarter, according to Frank Phillips, president of the company. In his annual report Mr. Phillips stated that drilling operations were suspended during the last half of 1923, a period of overproduction and low prices, but have been resumed with an attendant increase in production of several thousand barrels daily over 1923 average. The company is drilling ninety wells in proved mid-continent areas and twelve test wells on selected blocks aggregating over 40,000 acres. Leases on more than 250,000 acres were acquired last year, making the total net acreage 495,000 acres, compared with 218,000 acres at the end of 1922.

Financial

Report of Columbian Carbon Co. and subsidiaries for year ended Dec. 31, 1923, shows net profit of $3,386,253, after depreciation, depletion and federal taxes, equivalent to $8.42 a share earned on outstanding 402,131 no par shares of capital stock. This compares with $1,877,642, or $5.65 a share, earned on outstanding 331,846 shares of no par capital stock in 1922.

Directors of the Pan American Petroleum & Transport Co. have declared a quarterly dividend of $1 on the common and common B stock.

The Western Electric Co. for the year ended Dec. 31 reports net income of $8,919,513, equivalent to $14.38 a share earned on 500,000 shares of no par common stock, after allowance for dividend on preferred.

Standard Textile Products Co. reports gross sales of $23,000,000 for 1923, against $17,400,000 in 1922, and $12,800,000 in 1920. Net earnings for 1923 are estimated at $11.50 a share on the common stock, against $7.28 a share in 1922.

The Canadian Salt Co. has declared regular quarterly dividend of 2 per cent payable April 1.

At the annual meeting of Union Carbon & Carbide Corporation directors were re-elected with the exception of James A. Allison, who was succeeded by Joseph P. Day.

Oil Pollution Regulation Expected Soon

Hearings in progress before the Rivers and Harbors Committee of the House indicate that the committee will approve federal regulation of oil pollution in both coastal waters and inland waterways. It seems very probable, however, that the legislation will be confined to oil pollution and will not undertake to prescribe such regulation for factory wastes, mine waters and other polluting agents that are comparatively insignificant. This also seems to be the attitude of the Senate committee. The Senate already has passed a bill covering the situation in coastal and waters inland as far as affected by the tide.

Dumping Order on Cyanide of Soda Withdrawn

Announcement was made last Wednesday by Assistant Secretary of the Treasury Moss that dumping notices were withdrawn from cyanide of soda imported from Germany by the Roessler & Hasslacher Chemical Co. Investigation disclosed, he stated, that the importing company is not the sole American manufacturer of sodium cyanide and that its German importations are of a lower grade material than that which the Roessler & Hasslacher Co. produces at its domestic plant at Perth Amboy.

Men You Should Know About

Dr. THOMAS S. BAKER, president of the Carnegie Institute of Technology, Pittsburgh, Pa., gave an address over the radio on March 11, on the subject of "Pittsburgh as a Center of Engineering Education."

ESKIL BERG, of the consulting engineering department of the General Electric Co., Schenectady, N. Y., spoke before the Franklin Institute, March 19, on "Pressure, Superheat and Reheating as Affecting Power Plant Economy."

JOHN BERGE, chief engineer of the A. C. Spark Plug Co., Flint, Mich., has resigned, and will devote his attention to developing his own inventions.

FRED C. BRUNKE, manager of the United States Steel Products Co., Toronto, is spending a month's holidays in the Southwestern states.

F. E. DODGE, formerly for 16 years with The Barrett Co., is now with the technical service of the National Lead Co., and will be connected with its Chicago and St. Louis offices.

Dr. WILLIAM DREYFUS, chief chemist for the past 25 years with the West Disinfectant Co., New York City, is taking a 6 months leave, during which time he will visit his old home in Switzerland, the principal cities of Europe and parts of Egypt and Palestine.

H. M. EVANS, of Pasadena, Calif., has been elected chairman of the board of directors of the Lion Oil Refining Co., Eldorado, Ark. ERNEST C. WINTERS, formerly vice-president of the White Eagle Oil & Refining Co., has been elected president.

Dr. COLIN G. FINK, professor of electrochemistry, Columbia University, New York, addressed the members of the Connecticut Valley Section of the American Chemical Society on "The Hydrometallurgy of Copper" at a dinner meeting recently held at the new Hotel Burritt, New Britain, Conn.

F. A. J. FITZGERALD, of Niagara Falls, N. Y., will discourse on the "Electrochemical Progress and Processes in the United States" at the coming World Power Conference to be held at London, June 30 to July 12.

EDWARD W. HANNELLE, of the Johns-Manville Co., New York, spoke before the members of the Engineers' Club, Trenton, N. J., March 13, at the Hotel Stacy-Trent, telling the "Story of Asbestos." The lecture was illustrated with motion pictures showing production and processes of manufacture.

T. R. HARRISON has assumed charge of the research department of the Brown Instrument Co. Mr. Harrison was formerly associated with the pyrometry department of the Bureau of Standards and more recently with the Champion Porcelain Co. of Detroit.

Prof. CHARLES JAMES, of the University of New Hampshire, gave an address before the members of the Northeastern Section of the American Chemical Society at the Wedgewood Restaurant, Boston, Mass., March 14, on the subject of "Zirconium and Allied Elements."

F. L. KOETHEN, of the Acheson Graphite Co., Niagara Falls, N. Y., delivered a short talk before the Cleveland section of the Association of Iron & Steel Electrical Engineers March 10 on the subject "Recent Discoveries in the Theory of Lubrication and Their Application to Industrial Work."

C. WILBUR MILLER, president of the Davison Chemical Co., Baltimore, Md., has left for a trip abroad, to be absent several weeks. While on the Continent, he will inspect the first silica gel plant erected abroad for oil refining.

Prof. JAMES F. NORRIS, of the Massachusetts Institute of Technology, Cambridge, Mass., gave a demonstration and lecture regarding work in the chemical laboratory before an audience of about 500 persons at the Institute, March 9.

IRA T. PEACOCK, manager of the Canadian Oil Companies, Ltd., Calgary, has been appointed manager of the Montreal branch.

F. A. PIELSTICKER, vice-president of the Midland Refining Co., Eldorado, Kan., has been elected president of the Western Petroleum Refiners' Association. P. M. MISKELL, general manager of the Empire Refineries, Inc., and GEORGE D. LOCKE, vice-president of the Barnsdall Refining Co., were elected vice-presidents of the organization. ROY B. JONES, vice-president of the Pan-Handle Refining Co., was elected treasurer, and HOWARD BENNETTE was re-elected secretary.

EDWIN E. SLOSSON, scientist and author, gave the concluding address of the present season of the Trenton Lecture Course, Y.M.C.A. auditorium, Trenton, N. J., March 13, presenting a non-technical lecture on the subject of "Creative Chemistry," showing the importance of the industry to other lines of endeavor and daily life.

A statue of Dr. EDGAR FAHS SMITH, provost of the University of Pennsylvania from 1911 to 1920, will be erected on the university campus.

AUGUST STAUDT, president of the Perth Amboy Tile Co., Perth Amboy, N. J., has been appointed a member of the local Board of Health Commissioners.

W. C. STIRLING, manager of the Canadian Oil Companies, Ltd., at Edmonton, Alta., has been transferred to the Calgary branch.

Prof. ELIHU THOMSON, of the General Electric Research Laboratory, Lynn, Mass., has been awarded the Kelvin medal.

GUY E. TRIPP, chairman of the board of directors of the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., has been elected a director of the American Sugar Refining Co., New York.

LUDWIG VOGELSTEIN has been elected chairman of the board of directors of the American Metal Co., New York, succeeding B. HOCHSCHILD, resigned.

G. E. WALKER, formerly with the Dorr Co. and the Grasselli Chemical Co., is now superintendent of the North Hudson Chemical Co., Albany, N. Y., producing aluminum sulphate and sulphuric acid.

Obituary

Count HILAIRE BERNIGUAD DE CHARDONNET of Paris, France, member of the Academy of Sciences and inventor of the Chardonnet process for the manufacture of artificial silk, died on March 12.

DANIEL E. DERR, secretary and director of the B. F. Bond Paper Co., Baltimore, Md., died suddenly at his residence in that city on March 9, after an illness of but 3 days, aged 48 years. He is survived by his wife and three brothers.

T. J. FLEMING, secretary and treasurer of the California Portland Cement Co., Los Angeles, Calif., died suddenly on Feb. 28 at Keene Camp, his summer home in the San Jacinto Mountains.

Dr. ARTHUR E. HOULEHAN, assistant director of the Jackson Laboratory of the du Pont Dye Works, Wilmington, Del., died on March 10, after a brief illness. He had been connected with the du Pont organization since 1912, initially as a research chemist, and later in charge of the organic department at the experimental station. Since 1917 he had been assistant director of the Jackson Laboratory. Dr. Houlehan was born in Indiana in 1885. After graduation from Wabash College with the degree of A.B. he took a 4-year course of study at Cornell University, receiving his Ph.D. degree. For 2 years he was instructor in chemistry at Cornell. He is survived by his wife and one daughter.

FELIX JELLENIK, president of the Rubberoid Co., New York, died on March 13, aged 69 years. He had been connected with the company of which he was head since its establishment in 1886.

JOSEPH A. VANMATER, general manager of mines for the New Jersey Zinc Co., died at his home in Plainfield, N. J., March 11, in his seventy-fifth year. He was a graduate of Rutgers College, class of 1880. His wife and five children survive.

Market Conditions

Call for the Delivery of Chemicals Continues Along Quiet Lines

Slowing Up Reported in Contract Withdrawals as Well as in Orders for Fresh Commitments

REPORTS of the movement of chemical products are not encouraging. In many quarters it is stated that business so far this month has shown a decided falling off. This applies to demand for deliveries against existing contracts as well as to the volume of new business placed. Most of the trades which buy chemicals in a large way are not operating actively and evidently are carrying surplus stocks, both of finished products and of raw materials, which instil caution in making further purchases of materials.

The fact that some of the more important basic chemicals are sharing in the lessening of demand accentuates the quiet position of the market. Caustic soda, which until recently had been moving freely from plants, is reported to have been less in demand and export business has fallen off to a point where prices have been sacrificed to effect sales. Bleaching powder and liquid chlorine have been advanced in price on three separate occasions since the beginning of the year. This places the market in a better position to withstand any softness in price that may develop should customary conditions prevail during the hot weather period. It does not nullify the fact, however, that the majority of large consumers are covered by contracts placed when prices were considerably lower than existing schedules.

Reports from Washington intimate that the Tariff Commission is preparing to place before the President the result of investigations and hearings on chemicals on which petitions for changes in import duties were sought in accordance with the flexible provisions of the tariff act.

Owing to the fact that such important materials as bleaching powder, liquid chlorine, and cottonseed oil were selling at higher levels during the week, the weighted index number for the period shows a gain, the number being 160.60 as compared with 159.35 for the preceding week.

Acids

The position of oxalic acid has improved to a certain extent inasmuch as prominent importers have refused to quote at prevailing price levels and competition has thus settled more between domestic producers. Prices have not yet strengthened but the probability of a reaction is enhanced because of the lessened selling pressure. Formic acid is in good supply and values have been easy with reports that 13c. per lb. represented the market for imported grades. Acetic acid is quiet with prices none too steady. Citric and tartaric acids have found a fair outlet but demand was not so active as sellers had anticipated, but values are holding on a fairly steady basis. Lactic acid is in firm hands and recently announced advances in prices are well maintained. Mineral acids are weak whenever any large business is in sight and prices depend largely on seller.

Potashes

Bichromate of Potash—This material has been holding a steady course and while the market is not active, total consumption is said to be seasonal and producers seem content to hold out for the full quoted prices in making sales. Asking prices are 9¼@9¾c. per lb. on a quantity basis.

Arsenic Lower for Shipment —Prussiates Easier—Caustic Soda Quiet and Easy—Cream of Tartar Declines — Barium Products Firm — Bleaching Powder and Liquid Chlorine at Higher Levels — Permanganate of Potash Steady—Acetone Easy

Caustic Potash—Reports of firmness have ruled in this market but there has been a difference in price according to seller. In some quarters it is stated that arrivals from abroad have been large enough to take care of all needs and leave a surplus. The spot market is quoted at 6¾c. per lb. and while this figure also has been quoted for shipments, it is stated that it can be shaded on actual business.

Permanganate of Potash — There were bids in the market for spot goods at 13½c. per lb. but they went unfilled and holders were firm in their views at 14c. per lb. and upward according to quantity. Shipments from abroad continue to command a premium over the spot quotation.

Prussiate of Potash—Red prussiate is quiet and prices are largely a matter of private negotiation with 42@43c. per lb. as an approximation of the market. Yellow prussiate was generally reported as firm during the week with imported selections held at 20c. per lb. on spot and 19c. per lb. for shipment. There was an unconfirmed rumor that a domestic producer had sold at 17½c. per lb. f.o.b. works and this caused some uncertainty regarding the stability of prices.

Potash Sorts—Sellers say that buying has been restricted to small lots with first sorts holding at 8c. per lb.

Sodas

Acetate of Soda—While competition has been less keen and the low prices in effect a short time ago are no longer available there is a range according to seller and round lots can be obtained at 5c. per lb. f.o.b. works. Asking prices range up to 5½c. per lb. and even higher for small lots.

Caustic Soda—It is generally admitted that demand for caustic soda has eased off. Shipping instructions against old orders have been less frequent and consumers have not been interested in placing orders for further lots. There has been no change in the quotations of leading producers and it is stated that inquiry for moderate amounts calling for monthly deliveries over a long period have failed to find sellers under the $3.10 per 100 lb. level. This is the open quotation for contracts and evidently it is being adhered to in most quarters. There are reports that price shading has entered into transactions for prompt and nearby deliveries. It is also stated that export inquiries have brought out lower prices with sales said to have been made at $2.75 per 100 lb. f.a.s. Atlantic ports.

Nitrate of Soda—There has been little if any change in the position of nitrate in American markets. Demand for spot material has been quiet with $2.55 per 100 lb. generally asked by local sellers. In spite of reports of large production in Chile, the price at primary points is well maintained and reports from there state that large amounts are being shipped out on contracts and stocks are being kept below the levels of the corresponding period last year.

Prussiate of Soda—There was a sale of foreign prussiate on a basis of 10¾c. per lb. for goods afloat. Shipments were offered at 10½c. per lb. and spot offerings were on the market at 11c. per lb. The general tone was easy and sellers seemed willing to meet buyers' views in order to stimulate trading.

Soda Ash—Dense ash is said to be moving freely from producing centers with a fair call for fresh commitments. No change has been made in the contract price and sellers continue to offer at $1.35 per 100 lb. in bulk, $1.45 per 100 lb. in bags, and $1.69 per 100 lb. in bbl., carlots, f.o.b. works. Light ash is quiet but unchanged in price with contracts offered at $1.25 per 100 lb. in bulk, $1.38 per 100 lb. in bags, and $1.63 per 100 lb. in bbl., carlots at works.

Miscellaneous Chemicals

Acetone—The market has retained an easy tone with asking prices down to 18@18½c. per lb., according to seller. Methyl acetone likewise has been easier and leading sellers are offering at 90 @95c. per gal., in tank cars, f.o.b. works.

Arsenic — About the only change noted in this market was an easier feeling regarding shipments from abroad. This was especially true of distant shipments from Japan. According to reports prompt and nearby shipments of Japanese arsenic were quoted at 11½c. per lb., but this was not firm and on later positions credit was given to reports that under 11c. per lb. could be done. Spot arsenic was still quoted at 12c. per lb. with very little trading in either spot or forward positions.

Bleaching Powder—Effective March 15, a higher schedule of prices became effective. The new prices are on a basis of $1.90 per 100 lb. for standard large drums, carlots, f.o.b. works. In small drums, the carlot quotation is $2.15 per 100 lb. at works. Less carlot quantities are quoted at 15c. per 100 lb. above the carlot levels. Liquid chlorine also was advanced and the prices now effective either for spot or contract sales are $4.50 per 100 lb., in tank cars, $5.50 per 100 lb., in cylinders, carlots, $6.50 per 100 lb., in cylinders, for sales not more than 1 ton, $7.50 per 100 lb., in cylinders, for sales of less than 1 ton. These prices also are f.o.b. works.

Copper Sulphate—Moderate business has been reported with the market in a fairly steady position. Imported ranges from 4.60c. to 4.65c. per lb. with the inside figure applying to shipments. Domestic sulphate can be bought at 4.80c. per lb. in carlots at works. A good part of recent sales is said to have gone through on a delivered basis with the price varying according to destination point.

Cream of Tartar—Domestic producers have revised prices downward and are offering at 22½c. per lb. Some offerings of foreign origin were on the market at 22c. per lb. and the tone in general was easy.

Formaldehyde—Demand is said to have been irregular with the week generally described as quiet. Prices, however, are firmly maintained. On round lots producers are asking 11c. per lb. and smaller lots range up to 11½c. per lb. Resale lots are limited and thus offered very little competition.

Sal Ammoniac—A sale of imported gray sal ammoniac is said to have been made recently at a very low price and there were quotations from 7½c. to 8½c. per lb. in the past week, depending on grade and seller. Imported white is firmly held on spot with stocks limited and asking prices at 6¾@6¾c. per lb. On shipments from abroad 6½c. per lb. was quoted.

Sulphate of Ammonia—Some sales of single ton lots are said to have been made at $60 per ton and this price is still quoted for such lots. There has been but little interest in large lots either for home or for export. Quotations range from $2.85 to $2.95 per 100 lb. at works with the inside figure given as the f.a.s. quotation.

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14.

This week	160.60
Last week	159.35
Mar., 1923	178.00
Mar., 1922	156.00
Mar., 1921	157.00
Mar., 1920	252.00
Mar., 1919	233.00
Mar., 1918	281.00

The weighted index number advanced 125 points on the uplift in bleaching powder, liquid chlorine and crude cottonseed oil.

Alcohol

No important change took place in the market for denatured. Producers report a steady undertone, with business up to expectations for this period of the year. Completely denatured, formula No. 5, was maintained at 44½c. per gal., in drums, carloads. The special, formula No. 1, held at 45½c. per gal., in drums, carloads.

The market for methanol was inactive and some traders reported prices as just about steady. On the pure 90c. per gal. was asked, tank cars, prompt shipment from works. The 95 per cent, in drums, carload basis, settled at 85 @87c. per gal. Butyl alcohol was offered more freely for shipment and easier prices prevailed.

Coal-Tar Products

Phenol on Spot Unsettled—Imported Pyridine Steadies—Crude Naphthalene Offered Freely From Abroad—Benzene Firm

DEMAND for coal-tar products was less active in the past week, but prices did not move much one way or the other. On most of the crudes the undertone remains firm, first hands having little to offer except for future delivery. The action of the gasoline market has been disappointing. At current prices for the petroleum product an uplift in the market for the motor fuel grade of benzene seems unlikely. On the 90 per cent grade of benzene production is just about equal to the demand. There was more buying interest in refined naphthalene; crude for shipment from abroad was offered in a liberal way at practically unchanged prices. U.S.P. phenol on spot sold through second hands at prices ranging from 32@34c. per lb. Pyridine for shipment from abroad steadied somewhat on firmer views of shippers. Paranitraniline sold on spot at 72c. per lb. Aniline oil was steady in all directions. Cresylic acid was unsettled on keen competition for business pending.

Aniline Oil and Salt—With no surplus to contend with the market for aniline oil closed firm on the basis of 16c. per lb., drums extra, carload lots. For small parcels on spot 17c. was asked. Aniline salt was available at 22@23c. per lb., with the market barely steady in some quarters of the trade.

Alpha-Naphthylamine — Producers reported a slow market, but the quotation held at 35c. per lb., in bbl., immediate shipment. The market was steady in sympathy with basic materials.

Benzene—There is a good movement of motor fuel benzene into consuming channels against existing contracts, and, with the gasoline market on a steady basis, the undertone favors sellers. New business was restricted because of the sold up condition of leading producers. In the 90 per cent grade demand was routine only, but prices held on the basis of 23c. per gal., tank cars, f.o.b. works. The pure settled at 25c. per gal., tank car basis. Some export inquiry was around early in the week.

Beta-Naphthol—Demand quiet, but prices held at 25@26c. per lb., the inside figure obtaining for carload lots, shipment from works.

Cresylic Acid—Offerings fairly plentiful and prices irregular. Stocks are larger than a year ago and consumers buying in a hand-to-mouth way only. On the 97 per cent grade nominal quotations stood at 70@75c. per gal., according to quantity and seller. The 95 per cent material held at 65@70c. per gal. Foreign markets for the crude unchanged.

H-Acid—Small lots sold for immediate delivery at 72c. per lb. Prices steady, some holders asking as high as 75c. per lb.

Naphthalene—Inquiries for refined naphthalene more numerous, but business not likely to become active for another month or so. Prices steady, flake closing at 6@6½c. per lb., the inside figure being named on carload lots. Ball quoted at 7@7½c. per lb. Chips vary in price from 5@5½c. per lb., depending upon the color, etc. Crude for shipment from abroad offered freely at 2@2½c. per lb. c.i.f. basis.

Phenol—Scattered lots of resale material sold at prices ranging from 32@ 34c. per lb., in drums. Demand for prompt material less active and undertone a shade easier. Producers, however, continued to report the market as steady, with little available except on contract. Nominal quotation for forward material held at 28c. per lb.

Paranitraniline—Prices irregular, but firmer in some quarters of the trade. Business reported at 72c. per lb., immediate delivery. Demand routine only.

Pyridine—Demand inactive, but prices steadied on higher cables from abroad. Some traders now quote imported pyridine at $3.25 per gal., immediate delivery. On futures prices nominal and $3 per gal. might have been shaded.

Solvent Naphtha—First hands had little to offer and this accounts for the firm position of the market. Crude naphtha, in tank cars, works, nearby positions, available at 22c. per gal. The water white for shipment was nominal at 25c. per gal., tank car basis.

Vegetable Oils and Fats

Moderate Advance in Cottonseed Oil—Linseed Barely Steady—China Wood and Coconut Unsettled—Tallow Lower

TECHNICAL oils remained inactive, with the tendency of prices in buyers' favor. The edible oils moved into a better position, because of the recent decline in prices, which resulted in some improvement in demand. Cottonseed oil closed higher. Tallow sold at a new low for the movement. Coconut oil was offered for last quarter delivery at 8c. per lb., f.o.b. Pacific coast points.

Cottonseed Oil—Interest centered in the February report on cottonseed products. An analysis of the Bureau of the Census statement indicates consumption of refined oil for the month of 153,000 bbl., the showing being poor, but in line with expectations. Consumption of cottonseed oil for the 7 months ended Feb. 29 shows a decrease of approximately 270,000 bbl. compared with a year ago. The visible supply on the last day of the month was 1,068,000 bbl., against a total of 975,000 bbl. on the corresponding date a year ago. The report, according to most traders, was bearish, yet prices ruled steady up to the close. Sentiment in the option market was mixed. Some operators believe that the recent break in prices will stimulate buying interest and bring about a tight situation. It develops that when crude sold at 8c. per lb., tanks, f.o.b. mills, a soap maker took on 30 carloads. Refiners supported the nearby positions in refined oil, as crude came out in a small way only and at higher prices. There was selling of September oil which traders thought originated in refining circles. The total supply of refined oil available for the closing 5 months of the season is estimated at 1,200,000 bbl., and, allowing 400,000 bbl. for the carry-over, the quantity available for monthly distribution is placed at 161,000 bbl. Actual monthly distribution for the March-July period a year ago was 150,000 bbl. Crude offerings were light throughout the week and 8⅜c. was the nominal price in the Southeast. In Texas the market settled around 8¼c. per lb., tank cars, f.o.b. mills. Lard was slightly lower and this checked operations in refined oil to some extent. Reports have it that the South is still heavily long of July oil. Lard compound was not so active and 12c. per lb. could have been shaded in several quarters.

Linseed Oil—The week was a quiet one, and, while the undertone of the market was barely steady, prices underwent little change. The seed markets fluctuated within narrow limits. Crushers are gradually working into a better position as regards stocks of oil and this led to freer offerings in some directions. On futures it would have been possible to shade the market on a round lot, as several producers stood ready to "compete" for the business. Spot oil held nominally at 92c. per gal., with April at 91c. and May forward at 89c. June-July-August was nominal at 85c. per gal. The feature in the seed situation was the report by the Department of Agriculture on intended plantings for 1924. This statement of intentions to plant indicated an increase in the flaxseed acreage of 54 per cent. This is about in line with some of the private forecasts. Argentine offerings were readily absorbed, with American interests steady buyers of nearby seed. The South American market held fairly steady. Crop news from India was favorable, with harvesting in progress.

China Wood Oil—Early in the week prices were steady, but later on offerings increased, following closely upon the arrival of several shipments from Hankow. Towards the close business could have been done at 17½c. per lb., in bbl., immediate delivery. On the Pacific coast the market was unsettled at all times. Nearby oil was quoted nominally at 16½c. per lb., tank car basis, with futures at 16c. per lb., same terms.

Consumption of Cottonseed Oil in Feb. 153,000 Bbl.

Consumption of refined cottonseed oil in February, according to an analysis of the Bureau of Census figures, issued during the week, was 153,000 bbl., against 203,000 bbl. in January and 194,000 bbl. a year ago. Receipts of cottonseed in February amounted to 147,000 tons, against 93,000 tons a year ago. The report on cottonseed products covering the 7 months ended Feb. 29, together with the statistics for the corresponding period a year ago, follows:

	1923–24	1922–23
Seed received, ton	3,122,019	3,112,963
Seed crushed, ton	2,741,643	2,816,404
Crude oil mfd., lb.	807,708,183	860,330,826
Refd. oil mfd., lb.	596,696,709	700,930,351
Stocks, Feb. 29:		
Seed, ton	385,716	305,096
Crude oil, lb.	128,517,999	86,959,062
Refined oil, lb.	205,077,952	227,465,466
Exports, 7 months:		
Crude oil, lb.	17,878,526	19,479,200
Refined oil, lb.	8,988,442	29,415,782

Coconut Oil—April-May-June shipment from the coast, Ceylon type oil, closed at 8¼c. asked, with summer positions at 8¼c. and last quarter at 8c. per lb. The undertone was slightly easier, especially in futures, reflecting lower prices for copra. Manila sundried copra was offered at 5c. per lb., c.i.f. Pacific coast ports. The New York market for Ceylon type oil held nominally at 8⅜c. per lb., tank car basis, with business described as dull.

Corn Oil—Crude sold down to 8⅜c. per lb., tank cars, f.o.b. point of production. On steadier prices for cottonseed the market firmed up and towards the close 8⅜c. was asked.

Olive Oil Foots—Inquiry for prime green foots was in evidence, but bids were below the market. Importers refused to shade 9¾c. per lb., all positions, on prime green Italian.

Palm Oils—Further weakness in tallow restricted business in palm oils and easier prices obtained towards the close. There were offerings of Niger oil for immediate delivery at 6¾c. per lb. Bennin closed at 7.20c. per lb., with Lagos at 7¾c. per lb.

Rapeseed Oil—Sales of refined oil for nearby delivery were reported at 88c. per gal. March-April shipment from abroad settled at 83½c. per gal., with April-May at 82½c. and the more forward positions at 78@79c. per gal.

Soya Bean Oil—Prompt shipment from the coast was available at 10c. per lb., tank cars, duty paid, with futures barely steady at 9¾c. per lb., same terms. In New York 10½c. was asked, tank car basis, but the market was wholly nominal.

Tallow, Etc.—Late in the week a round lot of extra tallow sold at 7½c. per lb., ex plant, a decline of ¼c. for the week. The offerings were liberal and the undertone easy, even after the decline. Good quality yellow grease settled at 6½c. per lb. Oleo stearine was offered at 9½c. per lb., carload basis. No. 1 oleo oil declined to 13c. per lb., in bbl. Crude menhaden oil sold at 49c. per gal., in cooperage.

Miscellaneous Materials

Antimony—The market has remained in a firm position. Demand has been slow but basic conditions prevented any easing off in values. White oxide is offered at 9½@10c. per lb. Standard powdered needle antimony is quoted at 9@10c. per lb., and Chinese needle, lump, is scarce and nominal at 8½@9c. per lb.

Blanc Fixe—There is a good movement against contracts and new orders also are of fair volume. Values are steady with the dry offered at 4@4¼c. per lb. and pulp at $50 per ton.

Gambier — Restricted offerings for shipment from primary markets has had a strengthening effect on values for spot holdings and some grades are in very limited supply. Common gambier is quoted at 10½@10¾c. per lb. and plantation at 14@14½c. per lb. Cubes are practically out of the market.

Glycerine—There was a firmer market for crude and dynamite as inquiry was reported for both. Soap lye crude, basis 80 per cent, closed at 11c. asked, loose, carload lots, f.o.b. point of production. Bids for dynamite glycerine at 15¾c. were turned down and 16c represented the market in nearly all directions. Chemically pure held at 16½@17c. per lb., f.o.b. New York.

White Lead—In conjunction with the other lead pigments, this material is on a steady price basis with a good consumption reported. The metal market is in a strong position and this is reflected in the values for the derivatives. Producers offer basic carbonate, dry, at 10½c. per lb. in casks, carload lots.

Zinc Oxide—A better call is reported for deliveries against old orders and as large consumers are well covered ahead, this constitutes the main activity of the market. No new developments were reported and producers are holding prices at 7¾c. per lb. for lead free and 7½c. per lb. for 5 per cent lead sulphate. French process, red seal, is offered at 9¾c. per lb. and white seal at 12c. per lb.

Imports at the Port of New York

March 14 to March 20

ACIDS—Oxalic—16 csk., Rotterdam, R. W. Greeff & Co.; 31 csk., Rotterdam, Order. **Tartaric**—3 cs., Marseilles, H. Marks.

ALBUMEN—36 cs., Hankow, A. Klipstein & Co.

ALCOHOL—39 cs., Havre, Order.

AMMONIUM CARBONATE—10 bbl. and 10 csk., Liverpool, Brown Bros. & Co.; 10 csk., Liverpool, Order.

ANTIMONY REGULUS—250 cs., Hankow.

ANTIMONY SULPHIDE—7 csk., Southampton, L. H. Butcher & Co.; 200 bbl., Havre, Heemsoth, Basse & Co.; 75 csk., Newcastle, E. Hill's Son & Co.

ARSENIC—424 bbl., Piraeus, Brandies, Goldschmidt & Co.; 200 cs., Kobe, Iron Exchange Bank; 100 cs., Kobe, Suzuki & Co.; 300 cs., Kobe, J. D. Lewis & Co.; 500 cs., Kobe, Tahata & Co.; 300 cs., Kobe, J. D. Lewis; 160 cs., Kobe, Frazar & Co.; 400 cs., Kobe, Brown Bros. & Co.; 378 cs., Kobe, J. D. Lewis; 100 cs., Kobe, Morgan G. Graw & Co.; 183 bbl., Tampico, American Metal Co.

BARIUM CARBONATE—100 bg. ground, Newcastle, R. W. Greeff & Co.

BARYTES — 550,000 kilos, Rotterdam, Ore & Chemical Corp.

CALCIUM BORATE SLAG—2,337 bg. and 359,721 kilos (in bulk), Antofagasta, Pacific Coast Borax Co.

CASEIN—3,249 cs., Buenos Aires, Kalbfleisch Corp.

CHALK—200 bg., Antwerp, Brown Bros. & Co.; 1,700 bg., Antwerp, Bankers Trust Co.; 1,200,000 kilos, Dunkirk, J. W. Higman Co.; 1,000 tons (in bulk), London J. W. Higman Co.

CHEMICALS — 300 csk. Marseilles, Pomeroy & Fischer; 400 bg. sulphate, Marseilles, Cooper & Cooper; 18 dr., Rotterdam, C. B. Richard & Co.; 91 cs., Bremen, Pfaltz & Bauer; 11 pkg. Bremen, Order; 109 cs., Havre, E. Fougera; 16 cs., Bremen, Order.

COLORS—8 cs., Hamburg, A. Hurst & Co.; 6 csk. aniline, Antwerp, Irving Bank-Col. Trust Co.; 2 bbl., Bremen, F. Henjes, Jr.; 11 cs. aniline, Havre, Ciba Co.; 8 bbl. do., Havre, Carbic Color & Chemical Co.; 4 csk., Havre, Irving Bank-Col. Trust Co.; 4 csk., Liverpool, J. A. McNulty; 20 pkg. aniline, Liverpool, American Cell Chemical Mfg. Co.; 15 csk. earth, Bremen, Meteor Products Co.

CORUNDUM ORE—702 bg., Durban, Order.

DIVI-DIVI — 152 bg., Puerto Plata, Cordillera Comm. Co.; 683 bg., Pampatar, Eggers & Heinlein.

FERROCHROME—124 csk., Gothenburg, C. Hardy, Inc.; 50 bbl. and 100 cs., Havre, International Ores & Metals Selling Co.

FLUORSPAR—Quantity in bulk, Cape Town, Standard Bank of South Africa.

FUSEL OIL—13 dr., Dunkirk, Order; 7 bbl., Alexandria, Order; 60 csk., Libau, Order.

GALLNUTS—200 cs., Hankow, Zinsser & Co.

GUMS — 110 bg. copal, Antwerp, W. Schall & Co.; 503 bg., Antwerp, Chemical Natl. Bank; 1,042 bg., Antwerp, Order; 30 bg. sandrac, Hamburg, R. Hilliler; 13 bg. copal, Liverpool, Williams Shipping Agency; 25 cs. kauri, London, Davies, Turner & Co.

IRON OXIDE—60 csk., Liverpool, L. H. Butcher & Co.; 71 csk., Liverpool, J. A. McNulty; 5 csk., Liverpool, Hansen & Van Winkle Co.; 40 bbl., Malaga, A. D. Strauss & Co.; 175 bbl., Malaga, C. J. Osborn Co.; 80 bbl., Malaga, E. M. & F. Waldo; 166 bbl. Malaga, Reichard-Coulston, Inc.; 236 bbl. Malaga, C. K. Willims & Co.; 228 bbl., Malaga, W. Schall & Co.; 40 bbl., Malaga, Am. Exchange National Bank; 62 bbl., Malaga, Order; 10 csk., Liverpool, Scott, Libby Corp.; 10 csk., Liverpool, J. A. McNulty.

IRON POWDER—2 cs., Bremen, Mallinckrodt Chemical Works.

LITHOPONE — 60 csk., Rotterdam, E. Hill's Son & Co.

LOGWOOD EXTRACT—10 bbl., Kingston, J. Campbell & Co.

MINERAL WHITE—100 bg., Hull, Whittaker, Clarke & Daniels.

MAGNESITE — 313 bg., Rotterdam, Speiden, Whitfield & Co.

MANGROVE EXTRACT—100 cs., Liverpool, W. A. Ross & Bros.

MYROBALANS — 2,153 pkt., Calcutta, Asia Banking Corp.; 6,263 pkt., Calcutta, National City Bank.

OILS — Coconut — 1,170 tons (in bulk), Manila, Spencer Kellogg & Sons. **China Wood**—292 csk., Hankow, M. M. Oliver Produce Co.; 120 bbl., Hankow, Mitsui & Co.; 145 bbl., Hankow, International Acceptance Bank; 600 csk., Hankow, Mitsubishi Shoji Kaisha; 150 csk., Hankow, Banque Belge Pour l'T. Co.; 300 bbl., Hankow, Order. **Cod**—100 bbl., Hull, Chemical National Bank; 185 bbl., Hull, Order; 100 bbl., Aberdeen, Bowring & Co.; 100 bbl., Aberdeen, Order. **Olive Foots** (sulphur oil)—800 bbl., Patras, Order. **Palm Kernel**—200 bbl., Liverpool, Standard Bank of South Africa; 200 bbl., Hull, Order. **Palm**—40 csk., Cotonou, Co. Francaise de L'Afrique Occidentale; 236 csk., Cotonou, Order; 1 csk., Lagos, Order; 12 cs., Liverpool, Lever Bros. **Rapeseed**—61 bbl., Liverpool, Order; 147 bbl., Liverpool, Order; 260 bbl., Hull, Balfour, Williamson & Co.; 450 bbl., Hull, J. C. Francesconi & Co.; 475 bbl., Hull, Order. **Sesame**—375 bbl., Liverpool, Order; 100 csk., Marseilles, Petroleum Export & Marine Co. **Sardine**—2,000 bbl., Kobe, Cook & Swan Co.

OIL SEEDS—Castor—4,074 bg., Bombay, Order; 9,147 bg., Dairen, Baker Castor Oil Co. **Linseed**—8,566 tons, Buenos Aires, Order. **Sesame**—1,366 bg., Dairen, I. R. Boody & Co.; 600 bg., Shanghai, Order; 700 bg., Hankow, Bradford & Co.

PLUMBAGO — 400 bg., Genoa, C. Mathieu.

POTASSIUM SALTS — 10 cs. caustic, Gothenburg, General Chemical Co.; 20 bbl. sulphate, Bremen, Potash Importing Corp. of Am.

QUEBRACHO—1,973 bg., Buenos Aires, National Bank of Commerce.

QUICKSILVER—200 flasks, Rotterdam, Order; 100 flasks, Vera Cruz, Poillon & Poirier.

SHELLAC—138 bg., Hamburg, Irving Bank-Col. Trust Co.; 300 bg., Calcutta, J. C. Galstann; 200 bg., Calcutta, Arbithnot, Latham & Co.; 550 bg. and 25 cs., Calcutta, Order; 50 bx., Havre, Order.

SODIUM SALTS—336 cs. cyanide, Liverpool, Order; 5 cs. caustic, Gothenburg, General Chemical Co.; 336 cs. cyanide, Marseilles, International Banking Corp.; 245 pkg. do., Marseilles, Asia Banking Corp.; 200 dr. chlorate, Havre, C. Hardy, Inc.; 277 csk. hyposulphite, Marseilles, Order; 22 csk. prussiate, Liverpool, C. Tennent & Sons; 20 csk. persulphate, Liverpool, J. Turner & Co.; 22 csk. prussiate, Liverpool, Order.

SUMAC — 12 bg., Alexandretta, S. F. Zaloom & Co.

TALC — 2,500 bg., Genoa, Italian Discount & Trust Co.; 200 bg., Genoa, L. A. Salomon & Bro.; 300 bg., Genoa, Italian Discount & Trust Co.; 23 bbl., Havre, E. Utard.

TARTAR—10 bg., Marseilles, Order; 105 bg., Marseilles, C. Pfizer & Co.; 105 bg., Marseilles, Royal Baking Powder Co.

VALONEA — 2,027 bg., Smyrna, A. Benadava; 539 bg., Smyrna, First National Bank of Boston; 3,307 bg., Smyrna, Order.

WATTLE BARK—3,349 bg., Durban, Standard Bank of South Africa; 602 bg., Durban, Irving Bank-Col. Trust Co.; 3,765 bg., Durban, Tannin Corp.; 2,293 bg., Durban, Order.

WAXES—4 pkg. beeswax, Puerto Plata, Cordillera Comm. Co.; 200 cs. vegetable, Kobe, National City Bank; 25 bg. beeswax, Havana, Order; 320 bg. paraffin, London, Order; 62 bg., Santiago, Royal Bank of Canada.

WOOL GREASE—60 bbl., Bremen, Order.

WHITING—3,210 bg., Dunkirk, Taintor Trading Co.

ZINC OXIDE — 100 csk., Marseilles, Reichard-Coulston, Inc.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

CAUSTIC SODA. Stettin, Germany. Purchase.—9513.

CHEMICALS. Lima, Peru. Agency.—9475.

COAL-TAR PRODUCTS, naphthaline, and pitch. Genoa, Italy. Agency.—9476.

FERTILIZERS. Havre, France. Purchase and agency.—9468.

HEMATINE CRYSTALS. Bern, Switzerland. Purchase.—9495.

LOGWOOD or campeachy extracts. Bern, Switzerland. Purchase.—9495.

OIL, Cedar Leaf. Montreal, Canada. Purchase.—9505.

ROSIN. Cracow, Poland. Purchase and agency.—9512.

ROSIN. Cologne, Germany. Purchase.—9499.

ROSIN for manufacture of paper and soap. Turin, Italy. Purchase and agency.—9514.

BEESWAX and Carnauba Wax. Cologne, Germany. Purchase.—9499.

COTTONSEED and Oleo Oils. Saloniki, Greece. Agency.—9485.

Stock Quotations

	Last Week	This Week
Air Reduction	76¼	76
Allied Chem. & Dye	68⅜	67
Allied Chem. & Dye pfd	111¾	111
Am. Ag. Chem.	11	11¼
Am. Ag. Chem. pfd	31⅞	32⅛
American Cyanamid	*96	*97
Am. Drug Synd.	4⅞	4⅝
Am. Linseed Co.	17⅛	17
Am. Linseed pfd.	*37	34½
Am. Smelting & Refining Co.	60⅜	61½
Am. Smelting & Refining pfd.	98	98½
Archer-Daniels Mid. Co. w.i.	22½	22
Archer-Daniels Mid. Co. pfd.	86½	86
Atlas Powder	52	51
Casein Co. of Am	*65	*65
Certain-Teed Products	26	28
Commercial Solvents "A"	60⅜	*59
Corn Products	177⅜	178
Corn Products pfd.	118½	118½
Davison Chem.	52¼	52
Dow Chem. Co.	*45	*45
Du Pont de Nemours	131	130½
Du Pont de Nemours db	86⅜	86½
Freeport-Texas Sulphur	10	10¼
Grasselli Chem.	*125	*125
Grasselli Chem. pfd.	*100	*100
Hercules Powder	*104	*104
Hercules Powder pfd.	*104	*104
Heyden Chem.	*2	1⅞
Int'l Ag. Chem. Co. (new)	3½	3⅞
Int'l Ag. Chem. pfd	5⅜	5⅞
Int'l Nickel	13⅜	13⅜
Int'l Nickel pfd.	79	79½
Int'l Salt	*89½	89
Mathieson Alkali	32½	34⅛
Merck & Co.	66½	68½
National Lead	138½	144⅜
National Lead pfd.	*113	*115
New Jersey Zinc	*148	*148
Parke, Davis & Co.	80	80
Pennsylvania Salt	86	86
Procter & Gamble	*127	*127
Sherwin-Williams	31	31
Sherwin-Williams pfd.	*102	*102
Tenn. Copper & Chem.	7¼	7⅜
Texas Gulf Sulphur	61	60⅜
Union Carbide	60⅜	58½
United Drug	78	78
United Dvewood	*40	*39
U. S. Industrial Alcohol	75⅜	70⅜
U. S. Industrial Alcohol pfd.	101	*99
Va.-Car. Chem. Co.	1⅞	1⅝
Va.-Car. Chem. pfd.	7⅜	6⅜

*Nominal. Other quotations based on last sale.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

General Chemicals

Acetone, drums, wks.	lb.	$0.18 –	$0.19
Acetic anhydride, 85%, dr.	lb.	.38 –	....
Acid, acetic, 28%, bbl.	100 lb.	3.38 –	3.63
Acetic, 56%, bbl.	100 lb.	6.75 –	7.00
Acetic, 80%, bbl.	100 lb.	9.58 –	9.83
Glacial, 99½%, bbl.	100 lb.	12.00 –	12.78
Boric, bbl.	lb.	.10 –	....
Citric, kegs	lb.	.46½–	.48
Formic, 85%	lb.	.13–	.13½
Gallic, tech.	lb.	.45 –	.50
Hydrofluoric, 52%, carboys	lb.	.11 –	.12
Lactic, 44%, tech., light, bbl.	lb.	.12½–	.13
22% tech., light, bbl.	lb.	.06 –	.06½
Muriatic, 18° tanks	100 lb.	.80 –	.85
Muriatic, 20°, tanks	100 lb.	.95 –	1.00
Nitric, 36°, carboys	lb.	.04 –	.04½
Nitric, 42°, carboys	lb.	.04½–	.05½
Oleum, 20%, tanks	ton	16.00 –	17.00
Oxalic, crystals, bbl.	lb.	.10½–	.11
Phosphoric, 50%, carboys	lb.	.07½–	.08½
Pyrogallic, resublimed	lb.	1.55 –	1.60
Sulphuric, 60°, tanks	ton	9.00 –	10.00
Sulphuric, 60°, drums	ton	13.00 –	14.00
Sulphuric, 66°, tanks	ton	14.00 –	15.00
Sulphuric, 66° drums	ton	19.00 –	20.00
Tannic, U.S.P., bbl.	lb.	.65 –	.70
Tannic, tech., bbl.	lb.	.45 –	.50
Tartaric, imp., powd., bbl.	lb.	.27½–	.28
Tartaric, domestic, bbl.	lb.	.30 –	....
Tungstic, per lb.	lb.	1.20 –	1.25
Alcohol, butyl, drums, f.o.b. works	lb.	.40 –	.42
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.85 –	....
Ethyl, 190 p'f. U.S.P., bbl.	gal.	4.81 –	....
Alcohol, methyl (see Methanol)			
Alcohol, denatured, 190 proof			
No. 1, special bbl.	gal.	.51½–	...
No. 1, 190 proof, special, dr.	gal.	.45½–	...
No. 1, 188 proof, bbl.	gal.	.52½–	...
No. 1, 188 proof, dr.	gal.	.48½–	...
No. 5, 188 proof, bbl.	gal.	.50½–	...
No. 5, 188 proof, dr.	gal.	.44½–	...
Alum, ammonia, lump, bbl.	lb.	.03½–	.04
Potash, lump, bbl.	lb.	.03½–	.03¾
Chrome, lump, potash, bbl.	lb.	.05½–	.06
Aluminum sulphate, com., bags	100 lb.	1.40 –	1.50
Iron free bags	lb.	2.40 –	2.50
Aqua ammonia, 26°, drums	lb.	.06½–	.06¾
Ammonia, anhydrous, cyl.	lb.	.28 –	.30
Ammonium carbonate, powd. tech., casks	lb.	.12 –	.13
Ammonium nitrate, tech., casks	lb.	.09 –	.10
Amyl acetate tech., drums	gal.	3.50 –	4.00
Antimony oxide, white, bbl.	lb.	.09½–	.10
Arsenic, white, powd., bbl.	lb.	.12 –	.12½
Arsenic, red, powd., kegs	lb.	.15 –	.15½
Barium carbonate, bbl.	ton	65.00 –	68.00
Barium chloride, bbl.	ton	82.00 –	88.00
Barium dioxide, 88%, drums	lb.	.17½–	.18
Barium nitrate, casks		.08 –	.08½
Blanc fixe, dry, bbl.	lb.	.03½–	.04
Bleaching powder, f.o.b. wks., drums	100 lb.	1.90 –	....
Spot N. Y. drums	100 lb.	2.25 –	2.35
Borax, bbl.	lb.	.05½–	.05½
Bromine, cases	lb.	.28 –	.30
Calcium acetate, bags	100 lb.	4.00 –	4.05
Calcium arsenate, dr.	lb.	.11 –	.11½
Calcium carbide, drums	lb.	.05 –	.05½
Calcium chloride, fused, dr. wks.	ton	21.00 –	....
Gran. drums works	ton	27.00 –	....
Calcium phosphate, mono, bbl.	lb.	.06½–	.07
Camphor, cases	lb.	.76½–	.77
Carbon bisulphide, drums	lb.	.06 –	.06½
Carbon tetrachloride, drums	lb.	.07½–	.08
Chalk, precip.—domestic, light, bbl.	lb.	.04½–	.04½
Domestic, heavy, bbl.	lb.	.03½–	.04
Imported, light, bbl.	lb.	.04½–	.05
Chlorine, liquid, tanks, wks.	lb.	.04½–	....
Contract, tanks, wks.	lb.	.04½–	....
Cylinders, 100 lb., wks.	lb.	.05½–	.07½
Chloroform, tech., drums	lb.	.30 –	.32
Cobalt, oxide, bbl.	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks.	ton	16.00 –	18.00
Copper carbonate, bbl.	lb.	.18½–	.19
Copper cyanide, drums	lb.	.45 –	.46
Copper sulphate, dom., bbl., 100 lb.		4.85 –	5.00
Imp bbl.	100 lb.	4.60 –	....
Cream of tartar bbl.	lb.	.22 –	.22½
Epsom salt, dom., tech., bbl.	100 lb.	1.75 –	2.00
Epsom salt, imp., tech., bags	100 lb.	1.10 –	1.15
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.25 –	2.50
Ether, U.S.P., dr.	lb.	.14 –	.15
Ethyl acetate, 85%, drums	gal.	1.10 –	....
Ethyl acetate, 99%, dr.	gal.	$1.25 –	....
Formaldehyde, 40%, bbl.	lb.	.11 –	.11½
Fullers earth—f.o.b. mines	ton	18.00 –	20.00
Furfural, works, bbl.	lb.	.25 –	....
Fusel oil, ref., drums	gal.	3.50 –	....
Fusel oil, crude, drums	gal.	2.50 –	2.75
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40
Glaubers salt, imp., bags	100 lb.	.95 –	1.05
Glycerine, c.p., drums extra	lb.	.16½–	.17
Glycerine, dynamite, drums	lb.	.16 –	....
Glycerine, crude 80%, loose	lb.	.11 –	....
Hexamethylene, drums	lb.	.70 –	.75
Lead:			
White, basic carbonate, dry, casks	lb.	.10½–	....
White, basic sulphate, casks	lb.	.09½–	....
White, in oil, kegs	lb.	.12½–	....
Red, dry, casks	lb.	.12 –	....
Red, in oil, kegs	lb.	.13½–	....
Lead acetate, white crys., bbl.	lb.	.15 –	....
Brown, broken, casks	lb.	.14 –	....
Lead arsenate, powd., bbl.	lb.	.18 –	.20
Lime-Hydrated, bg. wks.	ton	10.50 –	12.50
Bbl., wks.	ton	18.00 –	19.00
Lime, Lump, bbl.	280 lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.11½–	....
Lithopone, bags	lb.	.06½–	.06¾
Magnesium carb., tech., bags	lb.	.08½–	.08½
Methanol, 95%, bbl.	gal.	.93 –	....
Methanol, 97%, bbl.	gal.	.95 –	....
Methanol, pure, tanks	gal.	.90 –	....
drums	gal.	1.00 –	....
bbl.	gal.	1.05 –	....
Methyl-acetone, t'ks.	gal.	.90 –	.95
Nickel salt, double, bbl.	lb.	.09½–	.10½
Nickel salts, single, bbl.	lb.	.10 –	.11
Orange mineral, csk.	lb.	.14½–	.15½
Phosgene		.60 –	.75
Phosphorus, red, cases	lb.	.70 –	.75
Phosphorus, yellow, cases	lb.	.35 –	.40
Potassium bichromate, casks	lb.	.09½–	.09½
Potassium bromide, gran., bbl.	lb.	.19 –	.20
Potassium carbonate, 80-85%, calcined, casks	lb.	.06½–	.06¾
Potassium chlorate, powd.	lb.	.07½–	.08½
Potassium cyanide, drums	lb.	.47 –	.52
Potassium, first sorts, cask	lb.	.08 –	.08½
Potassium hydroxide (caustic potash) drums	lb.	.06½–	.06¾
Potassium iodide, cases	lb.	3.65 –	3.75
Potassium nitrate, bbl.	lb.	.07½–	.09
Potassium permanganate, drums	lb.	.14 –	.14½
Potassium prussiate, red, casks	lb.	.43 –	.45
Potassium prussiate, yellow, casks	lb.	.19½–	.20
Salammoniac, white, gran., casks, imported	lb.	.06½–	....
Salammoniac, white, gran., bbl., domestic	lb.	.07½–	.07¾
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl.	100 lb.	1.20	1.40
Salt cake (bulk) works	ton	22.00 –	....
Soda ash, light, 58% flat, bulk, contract	100 lb.	1.25 –	....
bags, contract	100 lb.	1.38 –	....
Soda ash, dense, bulk, contract, basis 58%	100 lb.	1.35 –	....
bags, contract	100 lb.	1.45 –	....
Soda, caustic, 76%, solid, drums contract	100 lb.	3.10 –	....
Soda, caustic, ground and flake, contracts, dr.	100 lb.	3.50 –	3.85
Soda, caustic, solid, 76% f. a.s. N. Y.	100 lb.	3.00 –	....
Sodium acetate, works, bbl.	lb.	.05 –	.05½
Sodium bicarbonate, bulk	100 lb.	1.75 –	....
330-lb. bbl.	100 lb.	2.00 –	....
Sodium bichromate, casks	lb.	.07½–	.07¾
Sodium bisulphate (niter cake)	ton	6.00 –	7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb.	.04½–	.04½
Sodium chlorate, kegs	lb.	.06½–	.07
Sodium chloride	long ton	12.00 –	13.00
Sodium cyanide, cases	lb.	.19 –	.22
Sodium fluoride, bbl.	lb.	$0.09 –	$0.10½
Sodium hyposulphite, bbl.	lb.	.02½–	.02½
Sodium nitrite, casks	lb.	.08½–	.08½
Sodium peroxide, powd., cases	lb.	.28 –	.30
Sodium phosphate, dibasic, bbl.	lb.	.03½–	.03½
Sodium prussiate, yel. bbl.	lb.	.11 –	.12
Sodium salicylic, drums	lb.	.40 –	.42
Sodium silicate (40°, drums)	100 lb.	.75 –	1.15
Sodium silicate (60°, drums)	100 lb.	1.75 –	2.00
Sodium sulphide, fused, 60-62% drums	lb.	.03½–	.03½
Sodium sulphite, crys., bbl.	lb.	.03½–	.03½
Strontium nitrate, powd., bbl.	lb.	.10 –	.10½
Sulphur chloride, yel drums	lb.	.04½–	.05
Sulphur, crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Sulphur, flour, bag	100 lb.	2.25 –	2.35
Sulphur, roll, bag	100 lb.	2.00 –	2.10
Sulphur dioxide, liquid, cyl.	lb.	.08 –	.08
Tin bichloride, bbl.	lb.	.15½–	.16
Tin oxide, bbl.	lb.	.60 –	....
Tin crystals, bbl.	lb.	.39 –	.39½
Zinc carbonate, bags	lb.	.14 –	.14½
Zinc chloride, gran, bbl.	lb.	.05 –	.05½
Zinc cyanide, drums	lb.	.36½–	.37
Zinc dust, bbl	lb.	.08½–	.08½
Zinc oxide, lead free, bag	lb.	.07½–	....
5% lead sulphate, bags	lb.	.07½–	....
10 to 35 % lead sulphate, bags	lb.	.07 –	....
French, red seal, bags	lb.	.09½–	....
French, green seal, bags	lb.	.10½–	....
French, white seal, bbl.	lb.	.12 –	....
Zinc sulphate, bbl.	100 lb.	3.00 –	3.25

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.60 –	$0.65
Alpha-naphthol, ref., bbl.	lb.	.70 –	.75
Alpha-naphthylamine, bbl.	lb.	.35 –	.36
Aniline oil, drums	lb.	.16 –	.16½
Aniline salts, bbl.	lb.	.22 –	.23
Anthracene, 80%, drums	lb.	.75 –	.80
Anthraquinone, 25%, paste, drums	lb.	.80 –	.85
Benzaldehyde U.S.P., carboys	lb.	1.50 –	....
f.f.c. drums	lb.	1.60 –	....
tech, drums	lb.	70	....
Benzene, pure, water-white, tanks, works	gal.	.25 –	....
Benzene, 90%, tanks, works	gal.	.23 –	....
Benzidine base, bbl.	lb.	.80 –	.82
Benzidine sulphate, bbl.	lb.	.70 –	.72
Benzoic acid, U.S.P., kegs	lb.	.82 –	85
Benzoate of soda, U.S.P., bbl.	lb.	.65 –	.70
Benzyl chloride, 95-97%, ref., carboys	lb.	.40 –	....
Benzyl chloride, tech., drums	lb.	.25 –	....
Beta-naphthol, tech., bbl.	lb.	.25 –	.26
Beta-naphthylamine, tech.	lb.	.75 –	.80
Cresol, U.S.P., drums	lb.	.25 –	.29
Ortho-cresol, drums	lb.	.28 –	.32
Cresylic acid, 97%, works drums	gal.	.70 –	.73
95-97%, drums, works	gal.	.65 –	.68
Dichlorbenzene, drums	lb.	.07 –	.08
Diethylaniline, drums	lb.	.53 –	.55
Dimethylaniline, drums	lb.	.37 –	.38
Dinitrobenzene, bbl.	lb.	.18 –	.20
Dinitrochlorbenzene, bbl.	lb.	.21 –	.22
Dinitronaphthalen, bbl.	lb.	.30 –	.32
Dinitrophenol, bbl.	lb.	.35 –	.40
Dinitrotoluen, bbl.	lb.	.20 –	.22
Dip oil, 25%, drums	gal.	.28 –	.30
Diphenylamine, bbl.	lb.	.50 –	.52
H-acid, bbl.	lb.	.72 –	.75
Meta-phenylenediamine, bbl.	lb.	.95 –	1.00
Michlers ketone, bbl.	lb.	3.00 –	3.50
Monochlorbenzene, drums	lb.	.08 –	.10
Monoethylaniline, drums	lb.	.95 –	1.10
Naphthalene, flake, bbl.	lb.	.06 –	.06½
Naphthalene, balls, bbl.	lb.	.07 –	.07½
Naphthionate of soda, bbl.	lb.	.60 –	.65
Naphthionic acid, crude, bbl.	lb.	.60 –	.62
Nitrobenzene, drums	lb.	.09 –	.09½
Nitro-naphthalene, bbl.	lb.	.30 –	.35
Nitro-toluene, drums	lb.	.13½–	.14
N-W acid, bbl.	lb.	1.05 –	1.10
Ortho-amidophenol, kegs	lb.	2.30 –	2.35
Ortho-dichlorbenzene, drums	lb.	.15 –	.17
Ortho-nitrophenol, bbl.	lb.	1.20 –	1.30
Ortho-nitrotoluene, drums	lb.	.11 –	.12
Ortho-toluidine, bbl.	lb.	.13 –	.14
Para-aminophenol, base, kegs	lb.	1.30 –	....
Para-aminophenol, HCl, kegs	lb.	1.55 –	....
Para-dichlorbenzene, bbl.	lb.	.17 –	.20
Paranitraniline, bbl.	lb.	.68 –	.70
Para-nitrotoluene, bbl.	lb.	.58 –	.60
Para-phenylenediamine, bbl.	lb.	1.40 –	1.50
Para-toluidine, bbl	lb.	.88 –	.90
Phthalic anhydride, bbl.	lb.	.30 –	.34
Phenol, U.S.P., dr.	lb.	.28 –	.32
Picric acid, bbl.	lb.	.20 –	.22
Pyridine, dom., drums	gal.	nominal	
Pyridine, imp., drums	gal.	3.00 –	3.25
Resorcinol, tech., kegs	lb.	1.40 –	1.50

Resorcinol, pure, kegs	lb.	$2.15	– ....
R-salt, bbl.	lb.	.55	– .60
Salicylic acid, tech., bbl.	lb.	.32	– .33
Salicylic acid, U.SP., bbl.	lb.	.35	– ....
Solvent naphtha, water-white, tanks	gal.	.25	– ....
Crude, tanks	gal.	.22	– ....
Sulphanilic acid, crude, bbl.	lb.	.18	– .20
Toluidine, bbl.	lb.	1.00	– 1.05
Toluidine, mixed, kegs	lb.	.30	– .35
Toluene, tank cars, works	gal.	.26	– ....
Toluene, drums, works	gal.	.30	– ....
Xylidine, drums	lb.	.50	– ....
Xylene, pure, tanks	gal.	.40	– ....
Xylene, com., tanks	gal.	.28	– ....

Naval Stores

Rosin B-D, bbl. 280 lb.		$5.70	– .....
Rosin E-I, bbl. 280 lb.		5.75	– .....
Rosin K-N, bbl. 280 lb.		6.10	– $6.80
Rosin W.G.-W.W., bbl. 280 lb.		7.65	– 7.85
Wood rosin, bbl. 280 lb.		5.80	– 5.90
Turpentine, spirits of, bbl.	gal.	1.02	– .....
Wood, steam dist., bbl.	gal.	.88	– .....
Wood, dest. dist., bbl.	gal.	.70	– .....
Pine tar pitch, bbl. 200 lb.		5.50	– .....
Tar, kiln burned, bbl. 500 lb.		11.00	– .....
Retort tar, bbl. 500 lb.		11.00	– .....
Rosin oil, first run, bbl.	gal.	.43	– .....
Rosin oil, second run, bbl.	gal.	.47	– .....
Rosin oil, third run, bbl.	gal.	.50	– .....
Pine oil, steam dist.	gal.	.60	– .62
Pine oil, pure, dest. dist.	gal.	.55	– .....
Pine tar oil, ref.	gal.	.35	– .....
Pine tar oil, crude, tanks f.o.b. Jacksonville, Fla.	gal.	.30	– .....
Pine tar oil, double ref., bbl.	gal.	.70	– .....
Pinewood creosote, ref., bbl.	gal.	.....	– .52

Animal Oils and Fats

Degras, bbl.	lb.	$0.03½	– $0.05½
Grease, yellow, loose	lb.	.06½	– .06¾
Lard oil, Extra No. 1, bbl.	gal.	.85	– .....
Neatsfootoil 20 deg. bbl.	gal.	1.28	– .....
No. 1, bbl.	gal.	.88	– .92
Oleo Stearine		.09½	– .....
Oleo oil, No. 1, bbl.	lb.	.13	– .13½
Red oil, d'stilled, d.p. bbl.	lb.	.08½	– .08¾
Saponified, bbl.	lb.	.08½	– .08¾
Tallow, extra, loose	lb.	.07½	– .....
Tallow oil, acidless, bbl.	gal.	.86	– .....

Vegetable Oils

Castor oil, No. 3, bbl.	lb.	$0.15	– .....
Castor oil, No. 1, bbl.	lb.	.15½	– .....
Chinawood oil, bbl.	lb.	.17	– .18
Coconut oil, Ceylon, bbl.	lb.	.09	– .....
Ceylon, tanks, N.Y.	lb.	.08½	– .....
Coconut oil, Cochin, bbl.	lb.	.10½	– .10¾
Corn oil, crude, bbl.	lb.	.11	– .....
Crude, tanks, (f.o.b. mill)	lb.	.08¼	– .....
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.08½	– .08¾
Summer yellow, bbl.	lb.	.10½	– .....
Winter yellow, bbl.	lb.	.11½	– .11¾
Linseed oil, raw, car lots, bbl.	gal.	.92	– .....
Raw, tank cars (dom.)	gal.	.86	– .....
Boiled, cars, bbl. (dom.)	gal.	.94	– .....
Olive oil, denatured, bbl.	gal.	1.25	– 1.30
Sulphur, (foots) bbl.	lb.	.09½	– .10
Palm, Lagos, casks	lb.	.07½	– .....
Niger, casks	lb.	.06½	– .06¾
Palm kernel, bbl.	lb.	.09½	– .....
Peanut oil, crude, tanks (mill)	lb	.11½	– .....
Peanut oil, refined, bbl.	lb.	.14½	– .15
Perilla, bbl	lb.	.14½	– .14¾
Rapeseed oil, refined, bbl.	gal.	.90	– .....
Sesame, bbl.	lb.	.11½	– .11¾
Soya bean (Manchurian), bbl.	lb.	.11½	– .....
Tank, f.o.b. Pacific coast	lb.	.09½	– .10
Tank, (f.o.b. N.Y.)	lb.	.10¼	– .10½

Fish Oils

Cod, Newfoundland, bbl.	gal.	$0.65	– $0.67
Menhaden, light pressed, bbl.	gal.	.60	– .....
White bleached, bbl.	gal.	.62	– .....
Blown, bbl.	gal.	.66	– .....
Crude, tanks (f.o.b. factory)	gal.	.47½	– .....
Whale No. 1 crude, tanks, coast	lb.	.....	– .....
Winter, natural, bbl.	gal.	.75	– .76
Winter, bleached, bbl.	gal.	.78	– .79

Oil Cake and Meal

Coconut cake, bags	ton	$31.00	– ....
Cottonseed meal, f.o.b. mills	ton	38.00	– ....
Linseed cake, bags	ton	40.00	– ....
Linseed meal, bags	ton	42.00	– ....

Dye & Tanning Materials

Albumen, blood, bbl.	lb.	$0.50	– $0.55
Albumen, egg, tech, kegs	lb.	.95	– .97
Cochneal, bags	lb.	.32	– .34
Cutch, Borneo, bales	lb.	.04½	– .04¾
Cutch, Rangoon, bales	lb.	.13½	– .14¼
Dextrine, corn, bags 100 lb.		3.74	– 3.94
Dextrine gum, bags 100 lb.		4.09	– 4.19
Divi-divi, bags	ton	38.00	– 39.00
Fustic, sticks	ton	30.00	– 35.00
Fustic, chips, bags	lb.	.04	– .05
Gambier com., bags	lb.	.11	– .12
Logwood, sticks	ton	25.00	– 26.00
Logwood, chips, bags	lb.	.02½	– .03
Sumac, leaves, Sicily, bags	ton	.....	– .....
Sumac, ground, bags	ton	$125.00	– $ .....
Sumac, domestic, bags	ton	40.00	– 42.00
Starch, corn, bags 100 lb.		3.12	– 3.22
Tapioca flour, bags	lb.	.05½	– .06½

Extracts

Archil, cone., bbl.	lb.	$0.16½	– $0.20
Chestnut, 25% tannin, tanks	lb.	.01½	– .02½
Divi-divi, 25% tannin, bbl.	lb.	.04	– .05
Fustic, crystals, bbl.	lb.	.20	– .22
Fustic, liquid, 42°, bbl.	lb.	.08	– .09
Gambier, liq., 25% tannin, bbl.	lb.	.09½	– .10
Hematine crys., bbl.	lb.	.14	– .18
Hemlock, 25% tannin, bbl.	lb.	.03½	– .04
Hypernic, solid, drums	lb.	.24	– .26
Hypernic, liquid, 51°, bbl.	lb.	.09½	– .10½
Logwood, crys., bbl.	lb.	.14	– .15
Logwood, liq., 51°, bbl.	lb.	.08	– .09
Osage Orange, 51°, liquid, bbl.	lb.	.07	– .08
Osage Orange, powder, bg.	lb.	.14	– .15
Quebracho, solid, 65% tannin, bbl.	lb.	.05	– .05½
Sumac, dom., 51°, bbl.	lb.	.06½	– .07½

Dry Colors

Blacks–Carbongas, bags, f.o.b. works, contract	lb.	$0.07½	– $0.09
spot, cases	lb.	.11	– .15
Lampblack, bbl.	lb.	.12	– .40
Mineral, bulk	ton	35.00	– 45.00
Blues–Bronze, bbl.	lb.	.40	– .43
Prussian, bbl	lb.	.40	– .43
Ultramarine, bbl.	lb.	.08	– .35
Browns, Sienna, Ital., bbl.	lb.	.06	– .14
Sienna, Domestic, bbl.	lb.	.03½	– .04
Umber, Turkey, bbl.	lb.	.04	– .04½
Greens–Chrome, C.P. Light, bbl.	lb.	.28	– .30
Chrome, commercial, bbl.	lb.	.12	– .12½
Paris, bulk	lb.	.26	– .28
Reds, Carmine No. 40, tins	lb.	4.50	– 4.70
Iron oxide red, casks	lb.	.10	– .16
Para toner, kegs	lb.	1.00	– 1.10
Vermilion, English, bbl.	lb.	1.15	– 1.20
Yellow, Chrome, C.P. bbls.	lb.	.16½	– .17½
Ocher, French, casks	lb.	.02½	– .03

Waxes

Bayberry, bbl.	lb.	$0.25	– $0.26
Beeswax, crude, Afr. bg.	lb.	.23	– .23½
Beeswax, refined, light, bags	lb.	.32	– .34
Beeswax, pure white, cases	lb.	.40	– .41
Candelilla, bags	lb.	.23	– .23½
Carnauba, No. 1, bags	lb.	.37	– .38
No. 2, North Country, bags	lb.	.24	– .24½
No. 3, North Country, bags	lb.	.19½	– .20
Japan, cases	lb.	.20½	– .21½
Montan, crude, bags	lb.	.05½	– .06
Paraffine, crude, match, 105-110 m.p., bbl.	lb.	.05½	– ....
Crude, scale 124-126 m.p. bags	lb.	.04½	– .05
Ref., 118-120 m.p., bags	lb.	.05	– ....
Ref., 123-125 m.p., bags	lb.	.05½	– ....
Ref, 128-130 m.p., bags	lb.	.05½	– ....
Ref., 133-135 m.p., bags	lb.	.05½	– ....
Ref., 135-137 m.p., bags	lb.	.06	– ....
Stearic acid, agle pressed, bags	lb.	.11½	– .11¾
Double pressed, bags	lb.	.11½	– .12
Triple pressed, bags	lb.	.13½	– .13¾

Fertilizers

Acid phosphate, 16%, bulk, works	ton	$7.50	– $7.75
Ammonium sulphate, bulk f.o.b. works 100 lb.		2.90	– .....
Blood, dried, bulk	unit	4.10	– 4.15
Bone, raw, 3 and 50, ground	ton	26.00	– 28.00
Fish scrap, dom., dried, wks.	unit	.....	– .....
Nitrate of soda, bags 100 lb.		2.52½	– ....
Tankage, high grade, f.o.b. Chicago	unit	2.50	– 2.60
Phosphate rock, f.o.b. mines Florida pebble, 68-72%	ton	3.30	– 4.20
Tennessee, 75%	ton	7.00	– 7.25
Potassium muriate, 80%, bags	ton	34.55	– .....
Potassium sulphate, bags basis 90%	ton	45.85	– .....
Double manure salt	ton	27.00	– .....
Kainit	ton	7.22	– .....

Crude Rubber

Para—Upriver fine	lb.	$0.20	– .....
Upriver coarse	lb.	.16½	– .....
Upriver caucho ball	lb.	.18½	– .....
Plantation—First latex crepe	lb.	.22½	– .....
Ribbed smoked sheets	lb.	.22½	– .....
Amber crepe No. 1	lb.	.22½	– .....

Gums

Copal, Congo, amber, bags	lb.	$0.10	– $0.15
East Indian, bold, bags	lb.	.20	– .21
Manila, pale, bags	lb.	.19	– .20
Pontinak, No. 1 bags	lb.	.19	– .20
Damar, Batavia, cases	lb.	.23	– .23½
Singapore, No. 1, cases	lb.	.31	– .32
Singapore, No. 2, cases	lb.	.21½	– .22
Kauri, No. 1, cases	lb	.64	– .66
Ordinary chips, cases	lb.	.20½	– .21½
Manjak, Barbados, bags	lb.	.08	– .11

Shellac

Shellac, orange fine, bags	lb.	$0.60	– ....
Orange superfine, bags	lb.	.62	– ....
A. C. garnet, bags	lb.	.57	– ....
Bleached, bonedry	lb.	.68	– .69
Bleached, fresh	lb.	.58	– ....
T. N., bags	lb.	.58	– ....

Miscellaneous Materials

Asbestos, crude No. 1, f.o.b., Quebec	sh. ton	$300.00	– $400.00
Asbestos, shingle, f.o.b., Quebec	sh. ton	50.00	– 70.00
Asbestos, cement, f.o.b., Quebec	sh. ton	20.00	– 25.00
Barytes, grd., white, f.o.b. mills, bbl.	net ton	16.00	– 17.00
Barytes, grd., off-color, f.o.b. Balt.	net ton	13.00	– 14.00
Barytes, floated, f.o.b. St. Louis, bbl.	net ton	23.00	– 24.00
Barytes, crude f.o.b. mines, bulk	net ton	8.00	– 8.50
Casein, bbl., tech.	lb.	.11	– .12
China clay (kaolin) crude, No. 1, f.o.b. Ga.	net ton	7.00	– 8.00
Washed, f.o.b. Ga.	net ton	8.50	– 9.00
Powd., f.o.b. Ga.	net ton	14.00	– 20.00
Crude f.o.b. Va.	net ton	6.00	– 8.00
Ground, f.o.b. Va.	net ton	13.00	– 19.00
Imp., lump, bulk	net ton	15.00	– 20.00
Imp., powd.	net ton	45.00	– 50.00
Feldspar, No. 1 f.o.b. N.C.	long ton	6.50	– 7.00
No. 2 f.o.b. N.C.	long ton	4.50	– 5.00
No. 1 soap	long ton	7.00	– .....
No. 1 Canadian, f.o.b. mill, powd.	long ton	20.00	– .....
Graphite, Ceylon, lump, first quality, bbl.	lb.	.05½	– .06
Ceylon, chip, bbl.	lb.	.04½	– .05
High grade amorphous crude	ton	15.00	– 35.00
Gum arabic, amber, sorts, bags	lb.	.11	– .11½
Gum tragacanth, sorts, bags	lb.	.50	– .55
No. 1, bags	lb.	1.35	– 1.40
Kieselguhr, f.o.b. Cal.	ton	40.00	– 42.00
F.o.b. N. Y.	ton	50.00	– 55.00
Magnesite, crude, f.o.b. Cal.	ton	14.00	– 15.00
Pumice stone, imp., casks	lb.	.03	– .35
Dom., lump, bbl.	lb.	.05	– .05½
Dom., ground, bbl.	lb.	.05	– .06
Silica, glass sand, f.o.b. Ind.	ton	2.00	– 2.50
Silica, sand blast, f.o.b. Ind.	ton	2.25	– 3.50
Silica, amorphous, 200-mesh, f.o.b. Ill.	ton	20.00	– .....
Silica, glass sand, f.o.b. Ill.	ton	1.75	– 3.00
Soapstone, coarse, f.o.b. Vt., bags	ton	7.50	– 8.00
Talc, 200 mesh, f.o.b., Vt., bags, extra	ton	10.00	– .....
Talc, 200 mesh, f.o.b. Ga., bags	ton	8.00	– 12.00
Talc, 325 mesh, f.o.b. New York, grade A bags	ton	14.75	– .....

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$4.00	– $4.50
Corning	bbl.	2.15	– .....
Cabell	bbl.	2.20	– .....
Somerset	bbl.	2.30	– 2.50
Illinois	bbl.	2.07	– .....
Indiana	bbl.	2.08	– .....
Kansas and Okla. under 28 deg.	bbl.	1.00	– .....
California, 35 deg. and up	bbl.	1.40	– .....

Gasoline, Etc.

Motor gasoline, steel bbls.	gal.	$0.20	– .....
Naphtha, V. M. & P. deod, steel bbls	gal	.19	– .....
Kerosene, ref. tank wagon	gal.	.15	– .....
Bulk, W.W. delivered, N.Y.	gal.	.08½	– .09
Lubricating oils:			
Cylinder, Penn., dark	gal.	.22	– .22½
Bloomless, 30@31 grav.	gal.	.20	– .....
Paraffin, pale	gal.	.18	– .18½
Spindle, 200, pale	gal.	.22	– .....
Petrolatum, amber, bbls.	lb.	.04	– .04½
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140–$145
Chrome brick, f.o.b. Eastern shipping points	ton	45–47
Chrome cement, 40-50% Cr_2O_3	ton	23–27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	42–45
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	35–38
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65–68
9-in. arches, wedges and keys	ton	80–85
Scraps and splits	ton	85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	50–53
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	50–53
F.o.b. Mt. Union, Pa.	1,000	42–45
Silicon carbide refract. brick, 9-in.	1,000	1180.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N.Y.	ton	$200.00	– .....

Ferrochromium, per lb. of Cr, 1-2% C	lb.	$0.30	-.....
4-6% C	lb.	.10½	-.....
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	107.50	-.....
Spiegeleisen, 19-21% Mn	gr. ton	38.00	- 40.00
Ferromolybdenum, 50-60% Mo, per lb. Mo	lb.	2.00	- 2.50
Ferrosilicon, 10-12%	gr. ton	41.50	- 46.50
50%	gr. ton	75.00	- 80.00
Ferrotungsten, 70-80%, per lb. of W	lb.	.89	- .91
Ferro-uranium, 35-50%, of U, per lb. of U	lb.	4.50	-.....
Ferrovanadium, 30-40%, per lb. of V	lb.	3.50	- 4.00

Ores and Semi-finished Products

Bauxite, dom. crushed, dried, f.o.b. shipping points	ton	$5.50	- $8.75
Chrome ore Calif. concentrates, 50% min. Cr_2O_3	ton	22.00	- 23.00
C.i.f. Atlantic seaboard	ton	19.50	- 22.00
Coke, fdry., f.o.b. ovens	ton	5.00	- 5.50
Coke, furnace, f.o.b. ovens	ton	4.00	- 4.25
Fluorspar, gravel, f.o.b. mines, Illinois	ton	23.50	-.....
Ilmenite, 52% TiO_2 Va	lb.	.01½	-.....
Manganese ore, 50% Mn, c.i.f. Atlantic seaport	unit	.44	- .46
Manganese ore, chemical (MnO_2)	ton	75.00	- 80.00
Molybdenite, 85% MoS_2, per lb. MoS_2, N. Y	lb.	.80	-.....
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06	- .08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½	- .12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.11½	- .12
Pyrites, dom. fines, f.o.b. mines, Ga	unit	.12	-.....
Rutile, 95% TiO_2	lb.	.12	- .15
Tungsten, scheelite, 60% WO_3 and over	unit	10.00	-.....
Tungsten, wolframite, 60% WO_3	unit	9.00	- 9.25
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50	- 3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	12.25	- 2.50
Vanadium pentoxide, 99%	lb.	2.00	- 14.00
Vanadium ore, per lb. V_2O_5	lb.	1.00	- 1.25
Zircon, 99%	lb.	.06	- .07

Non-Ferrous Metals

Copper, electrolytic	lb.	$0.13½-$0.13¾
Aluminum, 98 to 99%	lb.	.27 - .28
Antimony, wholesale, Chinese and Japanese	lb.	.11½- .11¾
Nickel, 99%	lb.	.26 - .30
Monel metal, shot and blocks	lb.	.32
Tin, 5-ton lots, Straits	lb.	.57½
Lead, New York, spot	lb.	.09
Lead, E. St. Louis, spot	lb.	.08½
Zinc, spot, New York	lb.	.0675
Zinc, spot, E. St. Louis	lb.	.0640
Silver (commercial)	oz.	.64
Cadmium	lb.	.70-.75
Bismuth (500 lb. lots)	lb.	2.35
Cobalt	lb.	2.50-3.00
Magnesium, ingots, 99%	lb.	.90-.95
Platinum	oz.	120.00
Iridium	oz.	175.00-300.00
Palladium	oz.	83.00
Mercury .75	lb.	67.00-68.00
Tungsten	lb.	.95-1.00

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	20.25
Copper bottoms	30.25
Copper rods	20 75
High brass wire	18.75
High brass rods	16.00
Low brass wire	20.50
Low brass rods	21.00
Brazed brass tubing	24.50
Brazed bronze tubing	25.75
Seamless copper tubing	23.75
Seamless high brass tubing	22.50

OLD METALS—The following are the dealers purchasing prices in cents per pound

Copper, heavy and crucible	11.50 @ 12.00
Copper, heavy and wire	11.00 @ 11.25
Copper, light and bottoms	9.00 @ 9.25
Lead, heavy	8.00 @ 8.25
Lead, tea	6.25 @ 6.50
Brass, heavy	6.00 @ 6.25
Brass, light	5.00 @ 5.25
No. 1 yellow brass turnings	7.00 @ 7.25
Zinc scrap	4.00 @ 4.25

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$3.54	$3.54
Soft steel bars	3.54	3.54
Soft steel bar shapes	3.54	3.54
Soft steel bands	4.39	4.39
Plates, ¼ to 1 in. thick	3.64	3.64

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Alabama

DECATUR—The Decatur Mill & Elevator Co., recently organized, has plans under consideration for the erection of a local flour-blending mill, estimated to cost close to $45,000. The work will follow the construction of other milling buildings, for which arrangements are now being made. C. W. Knight is president; and R. H. Jervis, secretary.

California

TORRANCE—The Woolbestos Products Co. will soon begin the construction of a new plant at Arlington Ave. and 208th St., for the manufacture of mineral wool, utilizing steel scrap from the works of the Columbia Steel Corp. in this same district. It will cost about $25,000. John B. Lomasney is president.

MARYSVILLE—In connection with a general expansion program, the Marysville Brick Co. is planning for the installation of oil-burning kiln equipment, as well as the electrification of a portion of its works in the Feather River section.

RICHMOND—John Gerlach, Richmond, is said to be planning for the organization of a new company to construct and operate a local plant for the manufacture of tile and other burned clay products. The initial plant is expected to cost about $35,000.

Florida

MIAMI—The Board of City Commissioners has preliminary plans under advisement for the installation of a water-softening plant in connection with the municipal waterworks. Ernest Cotton is director of public utilities.

BARTOW—The Shearman Concrete Pipe Co., Knoxville, Tenn., has arranged an appropriation of about $30,000 for its proposed local plant for the manufacture of concrete culvert pipe, on which work will be commenced at an early date. An appropriation of $50,000 has been made for the new plant to be erected at Jacksonville, Fla., on tract of land recently acquired. The company will also construct and operate a plant at Roanoke, Va., to cost close to $50,000, and will soon select other sites in the southeastern district for branch plants, of which at least three will be built in the near future. The last noted will cost from $45,000 to $55,000 each.

CLEARWATER—The Standard Oil Co. has tentative plans under advisement for the rebuilding of the portion of its local oil storage and distributing plant, recently destroyed by fire with loss estimated at $50,000, including equipment.

Georgia

COREEN—The Clinchfield Portland Cement Co., Kingsport, Tenn., has commenced the construction of its proposed local mill, and purposes to push the work to earliest possible completion. The plant will consist of a number of buildings, with power house, and will be equipped to operate under the wet process with an initial annual rating of 750,000 bbl. It is estimated to cost close to $1,000,000, including equipment. It is expected to add additional units at a later date.

Illinois

CHICAGO—The United Cork Co. has leased a building on Eddy St., near Racine St., for a new local works, and will take immediate possession.

CHICAGO—Officials of the Barnsdall Corp., 910 South Michigan Ave., operating oil refineries, have formed a new company to be known as the Barnsdall Tripoli Products Co., to establish and operate a plant for the manufacture of washing powders and kindred specialties. The company will use a deposit of white silica sand at Neosho, Mo., as raw material, and plans for the development of this tract.

CHICAGO—The American Envelope Co., 817 West Washington St., has taken bids and will soon break ground for the construction of a new plant on Grand Ave., near Kedzie St. It will be 1-story and basement, estimated to cost about $100,000, including equipment. L. E. Russell, 25 North Dearborn St., is architect. R. G. Steinson is secretary and treasurer.

Indiana

INDIANAPOLIS—The Pitman-Moore Co., 111-17 North Capitol Ave., manufacturer of serums, compounds, etc., has commenced excavations for the erection of the first unit of a new plant at Madison Ave. and Morris St., to be 150x150 ft., estimated to cost about $200,000, with equipment. A refrigerating plant will be installed. Other plant units will be constructed at a later date. James E. Bartlett is president, and C. N. Angst, secretary and treasurer.

Iowa

CEDAR RAPIDS—The Pottsville Mfg. Co. has been organized to take over and expand the plant and business of the former Pottsville Clay Products Co., secured at a receiver's sale. It is expected to enlarge the works at an early date for expansion in the line of tile and kindred clay products, with the installation of considerable additional equipment.

Louisiana

NEW ORLEANS—The Standard Rubber Co., J. H. Cooper, president, has preliminary plans under consideration for the erection of a new local plant for the manufacture of automobile tires, inner tubes and other rubber products, estimated to cost in excess of $70,000, including equipment.

SHREVEPORT—The Arsenic Compound Co., recently organized with a capital of $50,000, is concluding negotiations for a local site for the erection of a new plant for the manufacture of compounds for the extermination of the boll weevil and other cotton parasites. Plans for the works will be arranged at an early date. It is expected to cost in excess of $30,000, with equipment. T. B. Weatherby is president; Andrew Stewart, vice-president; and H. S. Lonergan, treasurer.

Maryland

BALTIMORE—The Motor Engine Oil Co., manufacturer of lubricating oils, etc., has filed plans for the erection of a 1-story works, 36x60 ft., at 8th St. and the Philadelphia Road, and will commence work at once.

Massachusetts

PEABODY—The Hunt-Rankin Leather Co., 106 Beach St., Boston, has plans under way for the construction of an addition to its tanning plant at South Peabody, consisting of a 4-story structure, 45x172 ft., estimated to cost in excess of $125,000. Two floors will be given over to general production; a laboratory will be installed. J. Williams Beal Sons, 62 Summer St., Boston, are architects.

Minnesota

MINNEAPOLIS—The Bureau of Water, City Hall, J. A. Jensen, supervisor, plans for the installation of a chemical laboratory in the new buildings for the department at Fridley Park, for pumping and filtration plant service.

DULUTH—The Minnesota Steel Co. is arranging for the early rebuilding of its two local blast furnaces, handling one unit at a time to maintain operations at the plant. Each stack will be remodeled and relined, with the installation of equipment for complete modernizing.

MINNEAPOLIS—The Creo-Dipt Co., Inc., Vandalia St. and Territorial Road, St. Paul, Minn., manufacturer of creosote stains, etc., will hold in temporary abeyance the erection of its proposed local branch plant in the Northwest Terminal section, to be 1-story, 150x300 ft., estimated to cost $35,000. H. E. Gosek, president, is in charge.

MINNEAPOLIS—Spencer Kellogg & Sons, Inc., Flour Exchange, manufacturer of linseed oil products, will soon commence the erection of a grain elevator, with storage

tanks and equipment for a capacity of 450,000 bu. It will be located at 25th Ave., S. E., and 4th St.

Missouri

ST. LOUIS—The American Printing Ink Co., Pontiac Bldg., has leased a portion of the building at Pine and 19th Sts., and will remodel and improve for a new local plant. Equipment will be installed at an early date.

KANSAS CITY—The Western Milk Powder Co., 1006 West 17th St., recently organized, will soon begin the erection of a new 2-story plant for the manufacture of powdered milk. The installation will include a concentrator, drying rolls, tanks, steam power equipment, etc. E. K. Eby is secretary.

New Hampshire

NASHUA—The Boston & Maine Railroad Co., North Station, Boston, Mass., is completing the erection of a new local creosoting plant for all cross-ties and bridge lumber used on the road. The pressure cylinders and auxiliary operating apparatus will have a capacity for treating 5,000 ties daily, while storage facilities are being arranged for about 1,500,000 ties.

New Jersey

WHIPPANY—The Agar Mfg. Corp., 167 41st St., Brooklyn, N. Y., has acquired the former property of the Caledonian Paper Mill, on local site, recently held by the United Boxboard Co., New York, and plans for the construction of a new mill for the manufacture of its regular line of corrugated paper products. The plant will have a floor area of about 100,000 sq.ft., and will be equipped to give employment to approximately 150 operatives. It is expected to be ready for service in July. The former Caledonian mill was destroyed by fire several years ago, and was never rebuilt.

NEWARK—The Biffert Enameling Co., Inc., recently organized by Oscar Biffert and associates, has leased a portion of the building at 365-71 Ogden St. for a new plant, and will commence the installation of equipment at an early date.

OGDENSBURG—Fire, March 10, destroyed a portion of the ore mill and crushing plant of the Replogle Steel Co., at its local iron ore mines, with loss estimated at $40,000, including equipment. The structure was 40x60 ft., and gave employment to about fifty operatives. Rebuilding is under consideration.

North Carolina

SPRUCE PINE—Norman G. Smith & Co., Inc., a branch of the Maine Feldspar Co., Brunswick, Me., recently organized, has plans under way for the installation of equipment, with power house, on local kaolin properties for extensive commercial production. A clay washery is under consideration.

Ohio

LANCASTER—The Hocking Glass Co., manufacturer of table and illuminating glassware, pressed and blown, has tentative plans under consideration for the rebuilding of its local plant, destroyed by fire, March 7, with loss estimated at $750,000, including equipment. The plant has been giving employment to about 650 operatives. The company has recently had plans drawn for a new branch plant at Brenen, O., estimated to cost close to $500,000, and will likely proceed with this project at an early date. Thomas C. Fulton is secretary and treasurer.

ZANESVILLE—The Weller Pottery Co. has awarded a general building contract to the Dunzweiler Construction Co., Zanesville, for the erection of a 3-story addition to its plant, 60x355 ft., estimated to cost about $300,000, including equipment. H. A. Weller is general manager.

YOUNGSTOWN—The Youngstown Sheet & Tube Co. will commence the erection of its proposed sheet mill at the Brier Hill Works, consisting of eight hot mills and six cold mills, for which a building contract has been awarded to the Blaw-Knox Co., Pittsburgh, Pa. The plant will cost in excess of $500,000, with equipment. The United Engineering & Foundry Co., Pittsburgh, will furnish part of the machinery and orders for other apparatus will soon be placed.

LIMA—The Radiant Oil Co., has completed plans for the construction of a new grease manufacturing plant on Jameson Ave., to be 1-story, 25x100 ft., estimated to cost about $70,000, including equipment. E. E. Bessrie is general manager.

Pennsylvania

MOUNT PLEASANT—The Atlantic Refining Co. and the Freedom Oil Co., occupying adjoining properties, have plans under way for the rebuilding of the portions of their local distributing plants, destroyed by fire, March 8, with loss estimated at $65,000, including equipment.

PHILADELPHIA—The Crescent Ink & Color Co., 408 Vine St., has awarded a general contract to the Farrell-Roth Construction Co., 1624 Spruce St., for the erection of a new plant at Hamilton and 5th Sts., estimated to cost about $50,000, including equipment. Work will begin at once.

PHILADELPHIA—Samuel H. French & Co., Lawrence and Callowhill Sts., manufacturers of paints, varnish, etc., have completed plans for the erection of a new addition, including improvements in the present plant, estimated to cost $60,000, on which work will be placed under way at an early date.

Tennessee

MEMPHIS—The Standard Chemical Products Co., recently formed with a capital of $100,000, has taken over the plants and properties of the Fowler Chemical Co., and the Sanitary Products Co. The new owner will consolidate the works, and will develop maximum capacity in the line of commercial chemicals, polishes, cleaning compounds, etc. Enlargement in the present facilities is under consideration. David Lee is president.

Texas

ORANGE—The Sycamore Oil Co., a subsidiary of the National Oil Co., 17 Battery Place, New York, has plans in progress for extensions and improvements in its local plant, and will install additional equipment for a capacity of 10,000 bbl. of refined oil per day. It is said that the expansion will involve in excess of $125,000.

SAN ANTONIO—The San Antonio Portland Cement Co. has plans in preparation for the erection of additions to its mill at Centerville, near San Antonio, including a raw material structure, 30x100 ft., tanks and other equipment, estimated to cost $100,000. The W. E. Simpson Co., San Antonio, is engineer.

Washington

SEATTLE—The American Tar Co. will begin the erection of a 1-story plant, 60x155 ft., at 1720 Northlake Place, to cost about $85,000.

New Companies

FEDERAL ABRASIVE WORKS, INC., Westfield, Mass.; abrasive materials; $50,000. Henry P. Chandler, Brookline, Mass., is president and treasurer; William S. Chandler is also an official of the company.

PROTECTIVE COATINGS CORP., 133 West Washington St., Chicago, Ill.; special paints, etc.; $25,000. Incorporators: M. Lindquist and A. C. Spier.

MEMPHIS LIME & CEMENT CO., Memphis, Tenn.; hydrated lime and portland cement; $50,000. Incorporators: Herman Harris and W. T. McLain, both of Memphis.

COMMERICAL COLOR & CHEMICAL CO., 23 Mathewson St., Providence, R. I.; organized. Edwin Davenport, Jr., heads the company.

KOLLOG CORP. OF AMERICA, INC., Newark, N. J.; petroleum products; $250,000. Incorporators: Clarence H. Brown, Aaron W. Miller and Henry R. Downes. Representative: Arthur R. Denma, 790 Broad St., Newark.

PEQUEST PAINT & COLOR CO., Phillipsburg, N. J.; paints, varnishes, oils etc.; $200,000. Incorporators: George V. Janos, James E. Boyle and William O. Kaniper, 361 Prospect St., Phillipsburg.

IODINE PRODUCTS CO., 59 West Austin Ave., Chicago, Ill.; iodine and kindred products; nominal capital $3,000. Incorporators: Edwin Weil, Louis V. Merz and L. F. Ewertsen.

INDIANA LEATHER CO., Indianapolis, Ind.; leather products; $25,000. Incorporators: Don K. Hall and Frank H. Beckman, both of Indianapolis.

KELSEY-RISDEN CO., New York, N. Y.; glue and adhesive products; 500 shares of stock, no par value. Incorporators: G. R. Kelsey, S. S. Cox and R. E. Risden. Representative: W. J. Carlin, 2 Rector St., New York.

MERCURY OIL CORP., Boston, Mass.; refined oil products; $550,000. John Messenger is president; and Allen T. Rogers, Brookline, Mass., treasurer.

CAROLINA DRUG & CHEMICAL CO., Charlotte, N. C.; chemicals and chemical byproducts, drugs, etc.; $350,000. Incorporators: H. C. Dockery and P. C. Whitlock, both of Charlotte.

EDWARD D. REIDINGER CO., INC., Camden, N. J.; soaps, greases, etc.; $25,000. Incorporators: Edward D. Reidinger, George E. Hartman and Milton Rebsher. Representative: Samuel M. Shay, 428 Market St., Camden.

GOODWIN CHEMICAL CO., Dover, Del.; chemicals, carbon black, etc.; $600,000. Representative: United States Corporation Co., Dover, Del.

SUPERIOR OIL CO. OF MARYLAND, INC., Hagerstown, Md.; refined oil products; $100,000. Incorporators: Adam G. Hartgen and John Klu, Hagerstown.

TEMPLE FOUNDRY, INC., Alexandria, Va.; $25,000; iron, steel and other metal castings. Incorporators: Victor E. Beagle and Frank Michelbach, both of Alexandria.

AVRI DRUG & CHEMICAL CO., Jersey City, N. J.; chemicals, compounds, drugs, etc.; $20,000. Incorporators: Johan Vanden Corput, George Kohan and H. C. Fritsche, 421 Johnston Avenue, Jersey City.

HESELTINES - KEMIKALGOLD PRODUCTS, INC., Wilmington, Del.; liquid gold and kindred specialties; $400,000. Representative: Colonial Charter Co., Ford Bldg., Wilmington.

999 OIL PRODUCTS CORP., Mechanicsville, N. Y.; refined oils; $50,000. Incorporators: W. H. Davis, C. C. Heffernan and W. S. Story. Representative: H. J. Reilly, Mechanicsville.

TURPO CHEMICAL CO., Belleville, N. J.; chemicals and chemical byproducts; $100,000. Incorporators: Harold A. Beisler, Alvin T. Lipperd and Joseph Kaden, 364 Washington Ave., Belleville.

DAMEZ FOUNDRY CO., 7380 South Chicago Ave., Chicago, Ill.; iron and steel castings; $25,000. Incorporators: William B. Gemmill, Ernest R. Reichmann and D. Canavan.

CATSKILL MINING, OIL & REFINING CO., New York, N. Y.; refined petroleum products; $100,000. Incorporators: S. and H. W. Wiley, and C. A. Steurer. Representative: McDonnell & Lebett, Woolworth Bldg., New York.

UNITED STATES KAOLIN CO., Murphy, N. C.; operate kaolin and other clay properties for commercial production; $1,000,000. Incorporators: H. A. and E. E. Fisher, both of Murphy; and R. E. Harris, Rome, Ga.

CLINTON AUTO GLASS WORKS, 178 Badger Ave., Newark, N. J.; organized; glass specialties. Louis Karp, 394 Avon Ave., Newark, heads the company.

Industrial Notes

THE DOEHLER DIE-CASTING CO., of Brooklyn, N. Y., formally announces its acquisition recently of two new plants—one at Batavia, N. Y., and the other at Pottstown, Pa. The latter was the die-casting department of the Light Manufacturing & Foundry Co., which has been taken over by the Doehler company. It will be operated as the light manufacturing and foundry division of the Doehler Die-Casting company. No change in policy is contemplated. This division will specialize in the production of high-quality zinc alloy diecastings as heretofore, whereas the new plant at Batavia, N. Y., will specialize in the production of aluminum die-castings.

THE CONSOLIDATED PRODUCTS CO., INC., dealer in rebuilt machinery, has purchased a new warehouse in Newark, N. J. The property comprises two acres on the Erie Railroad with a building covering one-half acre of clear span. This company has just purchased the equipment of the former British-American Chemical Co., Ridgefield Park, N. J., the Park Corporation, Belleville, N. J., and the Perfection Tire & Rubber Co., Fort Madison, Iowa.

THE RAYMOND BROS. IMPACT PULVERIZER CO., of Chicago, Ill., announces the removal of its Eastern office to 43 Broad St., New York City. Telephone: Bowling Green 8260.